BBC MICRO·MASTER·ELECTRON·ATOM

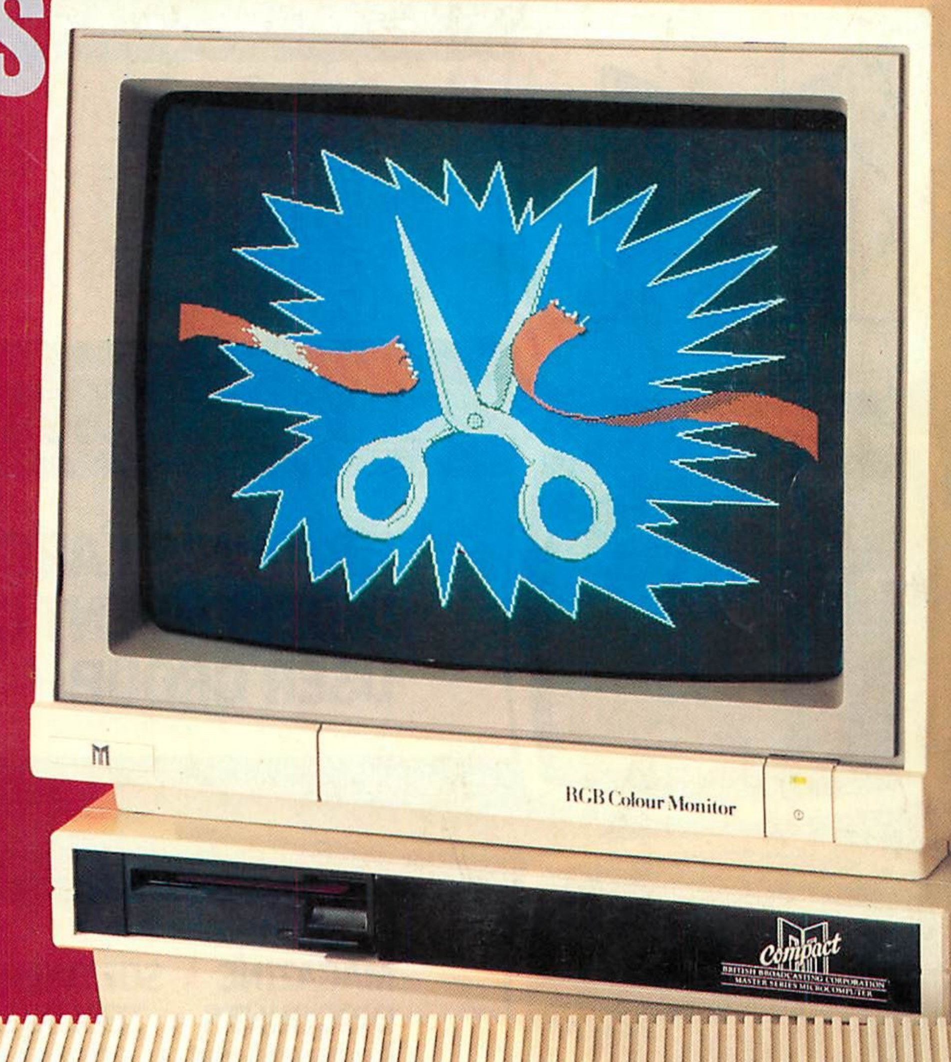
£1·25

ACORN USER

OCTOBER 1986

BIGGEST AND BEST-SELLING BBC/ACORN MAGAZINE

COMPACT: ACORN'S NEW MICRO



SCHOOL FOCUS:
Logo, networks and parents

SPIDER:
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DS/DD	80	9.50	8.70

3M 5¼"		Lifetime	Guarantee
SS/DD	40	11.90	11.00
DS/DD	40	14.00	13.20
SS/DD	80	17.50	15.50
DS/DD	80	18.70	16.50

3M 3½" TPI			
SS/DD	135	21.90	18.50
DS/DD	135	30.20	25.50

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DS/DD	40	15.80	15.40
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DS/DD	80	20.50	20.10

COMPUTER LABELS

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89 x 36	4.50	4.10
89 x 49	6.20	5.70
102 x 36	4.70	4.40

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9½" BACKING SHEET FOR FIXED TRACTOR

	PRICE PER 1000
70 x 36 3 across	4.00
89 x 36 2 across	6.60
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ENVELOPES

	Boxed	Price per box
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COMPUTER PAPER

Plain, fanfold, micro perf edges

Size	Weight gsm	1000s per Bx	Price per box 1 box	2 Bxs+
11 x 9½	60	2	13.00	12.20
	80	2	16.20	14.60
EXACT A4	70	2	21.50	18.90
11⅔ x 9¼	90	1	13.70	11.50
EXACT A4 Fixed Tractor Feed				
11⅔ x 9½	80	1	16.75	14.20
	100	1	29.00	27.50

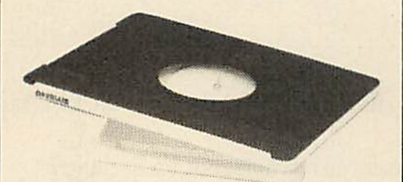
PRINTER LEAD

Centronics lead to connect BBC to EPSON KAGA CANON etc

1 mtr – 6.50
2 mtr – 8.50

SWIVEL BASES

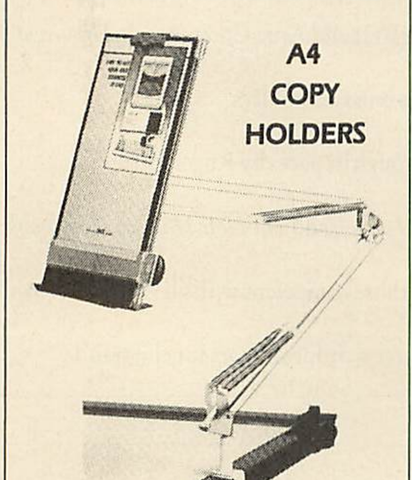
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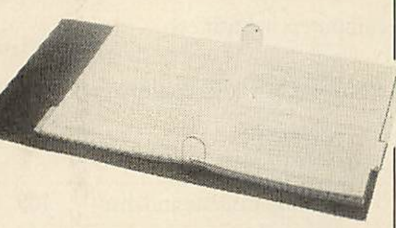
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AP100	2.95	2.40
INK JET CART	7.50 per 4	
BROTHER HR 5	3.00	2.80
M1009	3.70	3.20
HR15 MS	3.50	3.00
HR15 Fabric	3.60	3.10
CANON PW1156/1080	3.40	2.90
Red Brown Blue Green	5.30	4.70
CENTRONICS G.L.P.	3.70	3.20
DAISYSTEP 2000 M/S	3.10	2.60
Fabric	4.90	4.20
EPSON FX/MX/RX 80	3.00	2.60
Red Brown Blue Green	4.20	3.50
LX 80	3.00	2.60
Red Brown Blue Green	4.20	3.50
JUKI 6100 MS	2.50	2.10
6100 SS	1.60	1.30
Red Brown Blue	2.50	2.10
2200 Fabric	3.70	3.40
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KAGA KP810/910	3.40	2.90
Red Brown Blue Green	5.30	4.70
M/TALLY MT 80 M/S	4.00	3.20
NEC PC 8023	3.60	3.00
OKI 80/82	1.60	1.30
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GP 100/250	2.95	2.40
GP 500	3.90	3.30
SHINWA CP 80 M/S	4.00	3.20
SMITH CORONA		
EL 1000/2000 M/S	8.50	7.90
Fabric	3.90	3.60
Correctable	5.00	4.70
STAR GEMINI 10x 15x	1.60	1.30
Red Brown Blue	2.40	2.00
NL 10	5.60	4.90
WALTERS WM80 M/S	4.00	3.20

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5¼ x 100



MM 70L
5¼ x 70

MM50L
5¼ x 50

MM40L
3½ x 40



Rexel Mini Disc Box 30.
5¼ x 30
Brown smoked
Tilt lid. Cream plastic base



Plastic Library Case
5¼ x 10

DISC BOXES

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MM 70	5¼ x 70	10.90
MM 50	5¼ x 50	8.90
MM 40	3½ x 40	8.90
Mini Box Rexel	5¼ x 30	5.00
Library Case	5¼ x 10	1.50

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ACORN USER

ISSUE No 51 OCTOBER 1986

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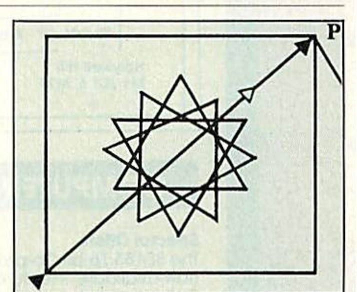
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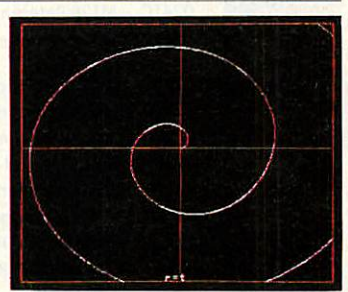
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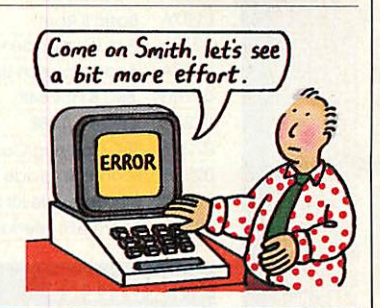
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On the move: dual screens for smooth animation
Plus full in-depth reviews of the new Master Compact and InterWord

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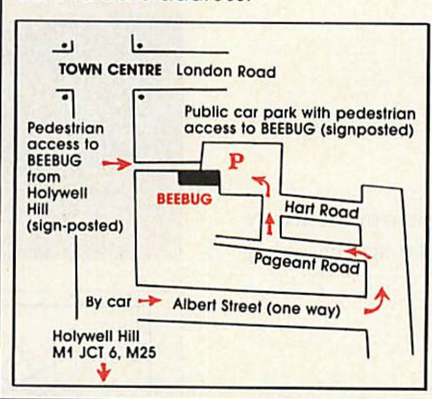
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- Disc Drives
- Budget Discs
- Software

COMPUTERS

Special Offers
The 80186 16-bit Co-processor for the Master 128 is now available. It features DOS+ and the GEM Collection as bundled software and is priced at £395. Basic II, which offers extra commands over the original, is now ex-stock at under £20.

Code	Description	Price Inc VAT
0200G	Master 128	489.00
0202G	Master ET	389.00
0230C	65C102 Co-Proc 6502 "Turbo"	119.00
0231D	80186 Co-Processor	395.00
0232D	32016 Co-Proc (When Available)	899.00
0234B	M128 Econet Module	47.00
0235B	M128 Eprom Cartridge	14.00
0240C	M128 Reference Manual 1 ADJ22	14.50
0241C	M128 Reference Manual 2 ADJ23	14.50
0242C	M128 Advanced Ref Manual ADJ24	19.50
0203F	'6502' 2nd Processor	189.00
0204F	'Z80' 2nd Processor	365.00
0205F	Acorn Prestel Adaptor	134.00
0206F	Acorn Teletext Adaptor	144.00
0217B	1770 Disc Interface Kit	48.00
0218A	ADFS Upgrade for 1770 DFS	29.00
0219B	Watford 1.43 DFS Kit	62.00
0214B	Watford DDFS Kit + Manual	60.00
0209A	1.2 DNFS Rom	19.50
0207A	Basic II Rom	19.50
0210A	A to B Upgrade Kit	69.00
0212A	Acorn Speech Upgrade	46.00
0220G	BBC B Plus 64K	459.00
0221G	BBC B+ 128K	489.00
0224F	BBC Carrying Case	14.95
0225B	Econet Upgrade for Model B	48.00
0226B	64K Upgrade Kit for B+ 64-128K	39.00
0237F	Acorn IEEE Interface	322.00

PRINTERS

Special Offers
The Taxan KP810 is still our most popular dot matrix printer and we highly recommend it for graphics, quick listings and NLQ-type letters, making it one of the most versatile printers available. Used in conjunction with the Fontaid package it becomes a very powerful tool.

Code	Description	Price Inc VAT
0311G	Kaga KP 810	255.00
0304G	Epson LX 80	225.00
0313C	LX80 Tractor Feed Unit	22.00
0315D	Cut Sheet Feeder for LX80	55.00
0316G	Taxan KP910 15" Printer	390.00
0319G	Epson FX85 NLQ Printer	438.00
0320D	FX85 Tractor Feed Unit	30.00
0321D	FX85 Sheet Feeder	130.00
0300G	Brother HR15XL Parallel Daisywheel	400.00
0301G	Brother HR15XL Serial Daisywheel	400.00
0310G	Juki 6100 Daisywheel	360.00
0309F	Ibico LTR1 Letter Quality	132.00
0302G	Canon PW1156A 15"	405.00
0303G	Canon PJ1080A colour	520.00
0308G	Epson JX 80 colour	520.00
0318G	Epson HI 80 Plotter	380.00
0305G	Epson RX 100	392.00
0306G	Epson FX 80	273.00
0307G	Epson FX 100	490.00
0340G	Plotmate A4 1200-001/80	340.00
0341G	Plotmate A4M	455.00
0342G	Plotmate A3M	625.00
0401A	2M Printer Lead	8.00
0402A	Epson FX/RX/MX80/FX85 Ribbon	3.00
0403A	Epson FX/RX100/FX105 Ribbon	4.00
0408A	Canon PW/Kaga Taxan Ribbon	5.00
0409A	Black Cartridge PJ1080A	7.00
0410A	Colour Cartridge PJ1080A	10.00
0413A	LX 80 Replacement Ribbon	4.50
0414A	Ibico Ink Roller	4.60
0415A	Epson JX80 Ribbon	14.90
0416A	Dust Cover KP810/PW1080A	5.45
0418A	Juki 6100 S/S Ribbon	1.55
0406D	11""9.5" Paper 2000 70gsm	14.50
0407C	3.5"" 1 7/16" Labels 1000	4.00
0453G	2-part NCR Listing Paper (1000)	23.00
0419C	"Fontaid" ROM & Disk 40T	30.00
0420C	"Fontaid" ROM & Manual 80T	30.00
0421B	"Fontaid" Extra Disc "A" 40T	15.00
0422B	"Fontaid" Extra Disc "A" 80T	15.00
0435C	MX80 Printhead Assembly	41.00
0437C	RX80/80FT Printhead Assembly	41.00
0438C	FX100/105 Printhead Assembly	57.00
0439C	LX80 Printhead Assembly	41.00

MONITORS

Special Offers
The Taxan monitors are still the most popular monochrome monitors, although the Zenith range, costing around £90, are still the best budget buy. The Microvitec 1451 is the recommended RGB monitor as it easily handles 80 column text and is priced at only £260.

Code	Description	Price Inc VAT
0500H	Kaga KX1201 Green Short Pers.	102.99
0501H	Kaga KX1202 Hi-res Green Monitor	116.00
0502H	Kaga KX1203 Hi-res Amber Monitor	116.00
0556A	Taxan 1201/2/3 Lead BNC	3.90
0503G	Zenith 123 12" Green	83.00
0504G	Zenith 122 12" Amber	87.00
0530H	Microvitec 1431 Med-res Monitor	206.00
0531H	Microvitec 1451 Hi-res Monitor	260.00
0550A	1.0m Monitor Lead RGB	5.75
0535H	Supervision III RGB	378.00
0555A	Supervision Monitor Lead	7.00
0551E	Single Master Plinth	16.10
0552E	Single Plinth for Monitor	12.65
0553F	Double Plinth for Monitor	23.00

DISC DRIVES

Special Offers
Cumana disc drives are on special offer for a limited period and while stocks last. The CD800S is exceptional value at only £274. The disc starter pack, which is all you need to upgrade to disc, contains a Cumana CSX100 drive, Acorn 1770 Disc Interface and 10 48 tpi discs all for £163.

Code	Description	Price Inc VAT
0600F	Cumana 100K CSX100 40T	104.00
0610F	Cumana 100K CS100 40T	125.00
0601G	Cumana 200K CDX200 40T	215.00
0602F	Cumana 400K CSX400 40/80T	141.00
0603F	Cumana 400K CS400 40/80T	160.00
0604G	Cumana 800K CD800S 40/80T	274.00
0614F	Cumana CS100E Excl Accessories	117.00
0615F	Cumana CS400E Excl Accessories	155.00
0222F	Disc Starter Pack	163.00
0611A	Cumana Disk Drive Guide	1.50
0650B	Memorex discs S/S D/D 48TPI 5210	15.50
0651B	Memorex Discs D/S D/D 96TPI 5420	25.50
0652A	Memorex Disc Head Cleaning Kit	9.65
0653A	Library Case – 10 discs	2.25
0654C	Disc Storage Box – up to 50 discs	9.00
0656D	Lockable Disc Box (80)	17.00

SOFTWARE

Special Offers
New items this month include Movie Maker as reviewed in Beebug Vol 5 No 2 and the latest game from Superior Software, Thrust at only £11.

Code	Description	Price Inc VAT
1022C	View 3.0 Rom	69.00
1000B	Acornsoft View 2.1	45.00
1013B	View Printer Driver Cassette	8.00
1014B	View Printer Driver Generator Disk	9.00
1001B	Acornsoft View Sheet	45.00
1002B	Acornsoft Hi-View	45.00
1019B	Acornsoft Viewstore Rom	45.00
1021A	Acornsoft Viewindex Disc	11.00
1043B	Acornsoft Viewspell Rom/Disc	33.00
1003A	Acornsoft Lisp Rom	48.00
1004A	Acornsoft BCPL	51.00
1026B	BCPL Standalone Generator	48.00
1005B	Acornsoft Comal	48.00
1006B	Acornsoft Logo	65.00
1007C	Acornsoft ISO Pascal	65.00
1028B	Pascal Standalone Generator	32.00
1008B	Acornsoft Basic Editor	28.00
1012B	Acornsoft Elite Disc Version	17.00
1023B	Acorn Elite Cassette	14.00
1015B	Acornsoft Revs Disc	17.00
1024B	Acornsoft Revs Cass	14.00
1016B	Acornsoft Aviator Disc	17.00
1044B	Acornsoft Aviator Cassette	14.00
1017B	Acornsoft GXR Rom B	28.00
1018B	Acornsoft GXR Rom B+	28.00
1027C	Micro Prolog	74.00
1029A	Revs 4 Tracks Disc	11.95
1032B	Revs 4 Tracks Tape	9.00
1026B	BCPL Standalone Generator	48.00
1031B	Acornsoft Termulator Rom	30.00
1033B	Microtext Disc	53.00
1034C	Microtext Plus Rom	240.00
1035B	6502 Development Pack	45.00
1038B	Acornsoft Database Disc	14.50
1040C	Micros in Business Disc	65.00
1041B	Acornsoft Forth Rom	48.00
1042B	Acornsoft Forth Disc	19.00
1100C	Wordwise Plus	46.00
1112A	Hi Wordwise Plus Disc	5.75
1102A	Wordwise	28.00
1103B	C.C. Graphics ROM	25.00
1104B	Printmaster (Epson)	28.00
1105B	Printmaster (Star)	28.00
1106B	Accelerator	56.00
1115B	Speech System inc TTS	33.50
1107B	Speech ROM	28.00
1108A	Acorn Speech Processor (With 1107)	10.00
1109B	Disc Doctor	27.00
1110B	Intersheet	47.70
1111A	Hi Intersheet Disc	5.75
1113B	Caretaker Rom	28.00
1114B	Interchart	29.90
1117B	Interword	47.00
1123A	SPEECH! Disc 40/80T	11.95
1124A	Citadel 40/80 Track Disc	11.95
1125A	White Knight Mk12 Disc	18.40
1126B	White Knight Mk12 Cassette	9.50
1127A	White Knight Mk12 for 1770 DFS	18.40
1129A	Thrust	11.00
1130A	Repton2	11.95
0703B	AMX Mouse	74.00
1150B	AMX Desk Disc	19.00
1151B	AMX 3D Zicon Disc	19.00
1152B	AMX Database Disc	19.00
1153B	AMX XAM	19.00
1154C	AMX Pagemaker Plus	40.00
1155B	AMX Superart Rom	40.00
1156B	AMX Paint Pot Disc	10.99
1170D	Fleet Street Editor 40T	34.00
1171D	Fleet Street Editor 80T BOPS2	34.00
1172A	Mini Office II Cassette	14.50
1173A	Mini Office II 40T	16.50
1174A	Mini Office II 80T	16.50
1175A	Clares Replica III	15.00

OTHER HARDWARE

Special Offers
The ATPL Sidewise board is still the best way of adding extra rom space to your model B, although the Watford 12 Rom is a cheaper equivalent. As the Voltmace joysticks are proving so popular we have extended the special price for this month.

Code	Description	Price Inc VAT
0701A	Aries B32 RAM Card	86.00
0702A	Watford 32K RAM Card	65.00
0704A	ATPL ROM Board for Model B	39.00
0735A	ATPL Battery Backup kit	17.00
0740B	Aries B12 Rom Board	45.00
0749A	Aries B12C Adaptor	5.75
0705A	2764 8K eprom	3.45
0706A	27128 16K eprom	4.60
0707A	6264 8K ram	4.50
0708A	Eprom Extractor Tool	3.45
0709D	Watford Eprom Eraser	32.20
0710B	Softlife Eprom Blower	75.90
0711D	Nightingale Modem	120.00
0712A	Pace Comstarr	30.00
0714A	BBkey Function Key Labels	2.00
0715A	Dust Cover for BBC B/B+	2.99
0734A	Dust Cover for Master 128	4.60
0716F	Music 500	114.00
0717A	Watford Sideways ZIF	17.25
0718B	Voltmace Delta 3B Single J'stick	10.00
0719B	Voltmace Delta 3B Twin Joystick	17.00
0720B	Voltmace Delta 14B Joystick	12.50
0721B	Voltmace Delta 14B/1 Interface	12.50
0741A	Voltmace Delta ASC/B	8.50
0731A	4-core RS423 Cable	0.60
0736A	Watford 12 Rom Board	36.80
0750B	Watford Solid State 16K RAM	32.20
0751B	Watford 16K RAM Module	33.35
0753B	Rom/Ram Board with 64K DRAM	78.20
0754B	Rom/Ram Board with 128K DRAM	121.90
0761E	Nightingale/Commstar Combo	135.00
0762E	Beebug Magic Modem	95.00
0763E	Beebug Magic Modem + Software	109.00

CARRIAGE

Carriage is denoted by the letter contained in the stockcode, A-50p, B-£1, C-£2, D-£3, E-£4.50, F-£5.50, G-£7.

When ordering several items, use the highest price code plus half of each subsequent code, up to a maximum of £7. For courier delivery use code G.

Overseas customers please send the same amount. The VAT will be used to cover the extra postage and insurance.

BFPO customers deduct VAT from the goods purchased and add UK postage.

ORDER FORM

BEEBUG MAIL ORDER

Dolphin Place, Holywell Hill, St.Albans, Herts. AL1 1EX

(Dolphin Place is opposite 18 Holywell Hill in the centre of St.Albans).

CODE	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL

NAME: SUB TOTAL £

ADDRESS: CARRIAGE £

POSTCODE: TOTAL £

ACCESS/BARCLAYCARD NO:

In accordance with our competitive pricing structure prices are subject to alteration at any time.

News

Hot Sahara

Survival in Africa is the theme of *Sand Harvest*, a role-playing game which simulates life on the edge of the Sahara and shows why the desert is spreading.

The disc costs £25 plus VAT, the network version is about £35. CWDE, Regent's College, Inner Circle, Regent's Park, London NW1 4NS.

Library system

Edlib is a software system for the MEP bar code reader designed to run a library for an average school with up to 65,000 books for 2500 students.

Contact Addison Wesley, Finchampstead Road, Wokingham, Berks RG11 2NZ.

Prizes for projects

£8000 of prize-money is up for grabs in the 1986-7 Computer Applications Competition, run by the University of Kent and sponsored by Barclays Bank.

Details from University of Kent Computing Lab, Canterbury, Kent CT2 7NF.

Blunder Box

In the September issue there was an error in Joe's Jottings listings 8 and 9 (pages 122 and 123). To come up with the right listings swap lines 350 to 680 on listing 8 with lines 350 to 560 on listing 9 and re-enter line 340 as follows:

Listing 8:

```
340 FOR loop%=min TO max
```

Listing 9:

```
340 PRINTm$(loop%);STRING$(len-LEN(m$(loop%)), " ");
```

The discs and tapes are correct.

There was also a mistake in Mike Rawlings ROMFILE listings – if you can't wait for the corrections to be printed next month, send us an sae.

Acorn gives birth to Master Compact

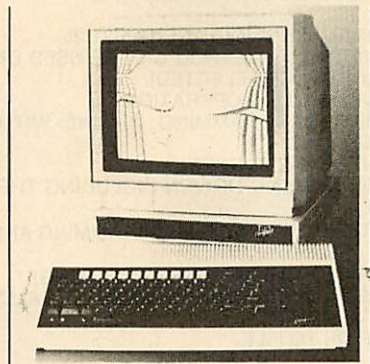
by Bruce Smith

Acorn's new computer, the £599 (plus VAT) BBC Master Compact was launched on September 1, ending the speculation about a new Baby Beeb computer. As its name implies, it's a cut-down version of the Master 128, rebundled to include a 3.5in disc drive running the Advanced Disc Filing System, and a colour RGB monitor at the top of the range.

The repackaging has seen the User Port, 1MHz expansion bus, cassette interface and second processor capability removed, though the Econet and serial interfaces remain, but require an upgrade to be fitted. The reshuffle includes a separate membrane keyboard and a disc box/power supply which also doubles as a monitor stand.

Two other versions of the machine are available – keyboard and disc drive only (£399+VAT) and with monochrome monitor (£469+VAT).

Acorn's philosophy is to aim



Compact: a cut-down Master

the Compact at the home environment with parents buying a computer that their children can 'grow' into. The educational bias is consolidated by the inclusion of the award-winning *ABC* wordprocessor and Logotron Logo packages.

The choice of the Advanced Disc Filing System (ADFS) working with 3.5in disc will raise a few eyebrows but the major software houses have worked with Acorn to make over 100 titles available on compilation discs at launch.

Olivetti will also be taking the Compact but under its own company colours, re-labelled Prodest. There will also be a nationwide chain of shops.

Such a movement should have huge financial benefits for the UK software market, which must have an excellent effect on the BBC/Master software market. Clares is a typical example with its *Artroom* already customised for the Olivetti Prodest and a firm order for 3000 packages. Olivetti has also expressed interest in *Fontwise* and a version of *BetaBase* has been agreed on.

Many will see the Master Compact as Acorn's reply to the successful Amstrad PCW computer – however this comparison should be avoided. As a wordprocessing system the PCW is still unsurpassed for price but has little other capability, while Acorn will further consolidate its position in the educational/home market.

● Turn to page 10 for details

Econet's new features

Acorn has added powerful new features to the Econet network with the launch of Infosystem, including automatic log-on.

Once on the system the user can create information files which can be called up on screen by anyone on the network.

Electronic mail has also been made possible by setting up text files which are write-only to everyone except the owner.

Finally, each user can create a telephone and address book using a wordprocessor.

The price and availability has yet to be announced, but Acorn expects it to appear soon.

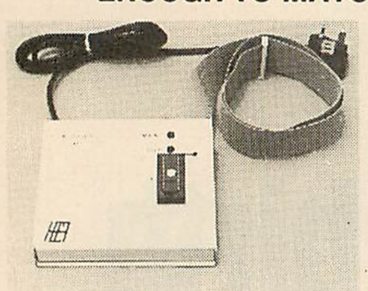
● Econet is the subject of a one-day conference at Bracknell on October 7. Speakers include teachers, SJ Research, Acorn, the BBC and *Acorn User's* own David Acton! Contact Ginnie Hume, ME Electronics, 5 Hatherley Road, Reading, Berks.

Lego control kits



Lego has launched a range of kits to construct models of washing machines, traffic lights, conveyer belts, robot arms and X-Y plotters. A control program, *Lego Lines*, runs on the BBC micro. Contact Lego's Education Division at Ruthin Road, Wrexham, Clwyd LL13 7TQ.

AT LAST AN EPROM PROGRAMMER POWERFUL ENOUGH TO MATCH THE MASTER.



The new MICRON 64K PLUS is now launched. NO OTHER EPROM PROGRAMMER can match the specifications yet it costs less than the competitiors which offer far less.

THE MICRON 64K PLUS runs on ANY VERSION of the BBC FITTED WITH A 1.2 OPERATING SYSTEM OR GREATER, VERY SIMPLE TO use with no switches to select. Two leds indicating power and programming are situated on the front panel. Plugs into 1MHz bus.

ATTRACTIVELY CASED IN CUSTOM BUILT SLOPING METAL BOX AND SPRAYED IN BBC MATCHING COLOURS.

THE SPECIFICATIONS:

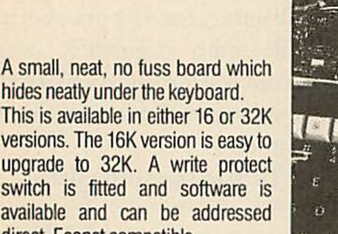
* FULLY MENU DRIVEN.
* WILL PROGRAMME 2716, 2732, 2764, 27128, 27256, 2532, 2564, 27512, 27513, 2516, IE MOST DEVICES 2K to 64K 2732A, 2764, ETC...
* PROGRAMS ALL EPROM'S 32K OR LESS IN A SINGLE PASS.
* FULLY BUFFERED
* SOFTWARE SELECTABLE PROGRAMMING VOLTAGE 12.5/21/25.
* NORMAL OR HIGH SPEED ALGORITHMIC METHOD CAN BE USED ON ALL EPROMS 8K, 16K, 32K, 64K (SOFTWARE SELECTED).
* ZIF SOCKET POWERED DOWN WHEN NOT IN OPERATION.
* VCC IS RAISED TO 6V DURING PROGRAMMING IN LINE WITH MANUFACTURERS RECOMMENDATIONS.
* MAINS DERIVED SELF CONTAINED POWER SUPPLY.

SOFTWARE SUPPLIED ON EPROM IS MENU-DRIVEN INCLUDING THE FOLLOWING ROUTINES:

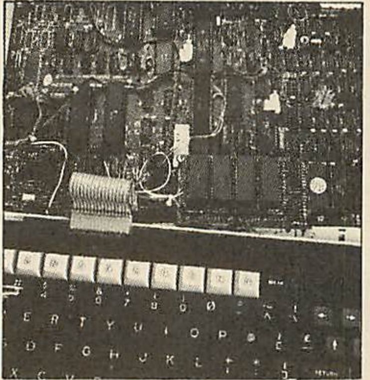
* AUTOMATIC VERIFICATION ON COMPLETION OF PROGRAMMING AND FAULT LISTING.
* BUILT IN FULL-SCREEN MEMORY EDITOR (BUFFER IS 32K LONG)
* SOFTWARE ALLOWS BLANK CHECK OF EPROM AND AUTOMATICALLY LISTS FAULTS.
* WILL COPY EPROMS TO BUFFER OR TO FILE.
* WILL GENERATE CHECKSUM.
* BBC FORMAT ROM IMAGES MAY BE CREATED USING A NUMBER OF BASIC OR MACHINE CODE PROGRAMS UP TO THE CAPACITY OF THE SELECTED ROM. MORE THAN ONE PROGRAM CAN BE STORED ON ONE EPROM.

PRICE ONLY £68.00 + £10.20 VAT + £3.00 P&P.

THE 16/32K SIDEWAYS RAM CARD



A small, neat, no fuss board which hides neatly under the keyboard. This is available in either 16 or 32K versions. The 16K version is easy to upgrade to 32K. A write protect switch is fitted and software is available and can be addressed direct. Econet compatible.

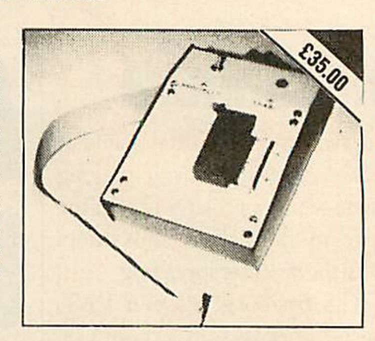


Cost:
Complete with 16k of Sideways RAM **£29.00** (VAT **4.35**) Total **£33.35**
Complete with 32k of Sideways RAM **£35.00** (VAT **5.25**) Total **£40.25**
Upgrade from 16k to 32k **£9.00** (VAT **1.35**) Total **£10.35**

SPECIAL OFFER WHILST STOCKS LAST EPROM PROGRAMMER

FOR THE BBC

A very high quality product direct from the manufacturers, contained in attractive sloping box with low insertion force socket and neon indicator for programming fitted as standard, the software adopts the high efficiency method for programming 2764 and 27128. This allows up to 100% faster programming, software in machine code, supplied on cassette and can be placed in eprom. Very easy to use, menu driven with easy to use instructions. This unit is completely self contained and plugs into the user port.



THIS PROFESSIONAL UNIT ALLOWS:

1. Will program: 2716, 2732, 2532, 2764 and 27128 eproms.
2. Copy eprom into memory and compute checksum.
3. Blank check eprom.
4. Program eprom from memory.
5. Verify byte by byte and compute checksum.
6. Allow buffer start area to be changed.
7. All operating system calls may be used when in menu mode.
8. Semi-intelligent programming. Typical time to program a 2764 8k device is approx. 50 sec. depending on the data to be programmed.
9. Additional software supplied to enable your own program (basic or machine code) to be put into eprom with the necessary leader information to allow calling with a *command. Downshift routine to enable basic programs to be run is also supplied.

ONLY £35 please add 15% VAT £1.00 post and packing
ALSO AVAILABLE RAM/ROM CARD
(Details on Request)

28 pin zif sockets suitable for plugging into ROM sockets £8.00 + VAT

AA95B

THE EXTERNAL ROM/RAM UNIT

NOW INCORPORATING MORE FACILITIES THAN BEFORE AT NO EXTRA COST.

A very powerful system which allows total flexibility for the user with a capability of 24 ROM sockets plus 64k of Sideways RAM (not supplied) built in a sturdy metal case with hinged lid for easy access, and sprayed BBC Oatmeal colour. Much thought has gone into the design of this unit to incorporate as many features as possible.

SOME ADVANTAGES:

*Allows up to 24 ROMS plus 64k of RAM or various combinations for the customer's requirements
*Easy to install. No Soldering. Takes no more than 15 mins
*Own power supply, no over heating
*Write protect switch fitted for RAM
*No access into BBC required after initial installation
*Does not physically interfere with other internal expansion add-ons
*Computer will still function with external unit unplugged (using ROM resident in BBC)
*Accessible for installing or removing ROMS

NEW FEATURES

***Battery backup facility**
***32k of RAM on each card**
***Read protect link**

The Unit

The case comes complete with an inbuilt power supply and one board capable of offering 12 Extra sockets plus the four in the BBC. 32k of Sideways RAM can be fitted to this board losing only 2 ROM sockets. A second board identical to the first can be fitted at a later date, giving a total capability of 28 sockets for ROM/RAM. Write protect toggle switch is fitted on the case and protects one or both boards. Read Protect Link again fitted to both boards. The installation of the unit is simple and should take no longer than 15 mins. The second card 1 min.

Cost:

Unit complete 1 board	**£75.00** (VAT **11.25**) Total **£86.25**
Second board	**£29.00** (VAT **4.35**) Total **£33.35**
Post	**£3.00**

All HCR's products are designed and manufactured by the company and carry a full year's guarantee with full technical backup available.

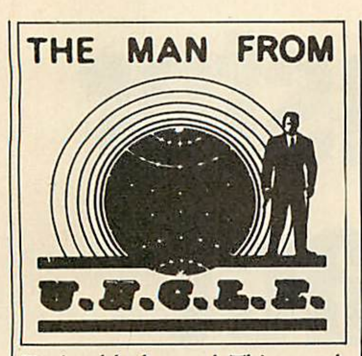
ORDERS TO:

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INGATESTONE ESSEX CM4 0BZ. Tel (0277) 355407/8





HCR ELECTRONIC SERVICES



I'm in a black mood. This month will be devoted to wingeing of the most pathetic and utterly despicable kind.

The exhibition was as excellent as usual, but why is such a good exhibition housed in catacombs that would frighten the life out of any fireman? Imagine trying to clear the place quickly in the event of fire! It was hard enough to find the exit under no stress at all. And smoking is allowed! I'm a smoker (just until I finish this packet) but it seems absurd to allow anything which could increase the risk. There are enough electrical appliances and cardboard boxes at these events to put me in all the danger I can handle. Not only that, but it's unpleasant to shuffle round in those caves like some character out of *Knightlore*. More space, more light – I'm not a mole.

And another thing! Why is it always in London? What's wrong with the Midlands or even the dreaded north (and I don't mean Highbury)? We don't attack all strangers up here – just those who look like southerners. That's fair isn't it?

Right. Now for the disc drive manufacturers. I bought a single Mitsubishi drive in a double drive case having been assured by the nice man selling it, that it would easily accommodate my trusty Teac drive. So it did. Unfortunately, the data cable connections are on opposite sides and one (take your pick) is upside down. If it hadn't been for my pal Percy who understands these things and is a wizard of the wires I would have been in real trouble.

All the flaming switches are on the back as well. Told you I was in a black mood. Did I lie?

Electron prominent at show

The 4th Official Acorn User Show went off with a big bang at the Barbican in July and, judging by the stream of people filing through the doors, was as popular as ever.

There were a number of exciting new releases at the show and some incredible bargains to be had – such as Twillstar's supply of Master 128 computers being sold at an unbelievable £399 – a saving of £100 if you could get your hands on one!

The Electron was prominent (except on Acorn's stand!), with several companies showing new products. Advanced Computer Products had a number of bargains for the Elk, with a variety of Acornsoft titles, including languages, at under £10. Permanent Memory Systems launched its sub-£100 6502 second processor for the BBC micro and Electron – the latter gives a 300 per cent speed increase, and, for a small additional cost, includes Hi-Basic. Slogger's Advanced Electron ROM Box Plus and Turbodriver for the Electron also captured interest.

Two leading software houses, Tynesoft and Superior Software, revealed new releases – *Commonwealth Games* and *Thrust*.



The 4th Acorn User Show: as popular as ever

On the Acorn stand most attention was directed to the two IBM-compatibles, the Master 512 and the Olivetti M19.

Commotion's stand was stacked with add-on goodies – the most notable was the new Scorpion controller system. Sharing the stand was Logotron whose Logo has been incorporated into the Master Compact.

Minerva Systems' excellent System Delta was on display with several new applications packages including video rental and mailing applications.

A team of Peartree dancing girls pulled the crowds to see Peartree's KBL computer system and business software, plus some first-class graphics displays on large monitors.

Watford Electronics and Solidisk stands were packed as ever, as readers examined the huge range of wares on show. Wild Vision's image processing and computer graphics card captured the interest of many visitors, enabling scenes to be captured and then displayed.

And of course *Acorn User*'s stand was well-represented with the new *Gallery Disc* selling out on the very first day. New releases included the *Assembler Extension ROM*, while readers thronged around the *AU* authors for advice, help and the occasional bit of praise!

Seeing red about home control

by David Johnson-Davies

Control, seen as the ultimate application for a micro in the home, has always been thwarted by the practical difficulties of interfacing to domestic appliances, and the wiring involved. Now it seems that with Red Boxes, General Information Systems has come up with the answer.

Red Boxes are intelligent interfaces which enable a BBC micro to control ordinary electrical appliances, and to receive inputs from different types of sensor. They avoid the need for special wiring by transmitting all the control information along domestic electrical mains cables. Data modulates a mains-borne 129 kHz radio frequency carrier, a frequency set aside by the British Standards Association for such applications.

The Red Boxes starter pack consists of three small units: Red One provides the electronically switched 13-amp socket into which you can plug any domestic appliance. Red Two is a wide-angle heat sensor, which can pick up radiation from a human body at several feet; this is intended for applications such as intruder alarms and stair lights.

The third unit, Red Leader, is programmed using a BBC micro as a terminal. At the simplest level a command menu allows you to switch on appliances, set on and off times, or trigger them from an input on the Red Two sensor.

The Red Box starter pack costs £129 including VAT, and additional units cost £34.95 each including VAT. Contact GIS, Croxton Hall, Croxton Park, Croxton, Cambs.

Acorn packs Master into £399 Compact

by Tony Quinn

After months of rumours and speculation, the Baby B, or the Master Compact 128 to give it its proper title, is here. And it looks very good indeed.

The machine will immediately raise comparisons with Acorn's own Electron and, of course, with Amstrad's computers.

First, what is the Compact? Acorn has taken the guts of the Master 128 which costs £499 (inc VAT) and cut out all the expensive, non-essential interfaces, which – although they give the BBC micro and Master great flexibility – are not necessary to most users in the home. The keyboard is now about half the size of the Master or BBC micro and a disc drive is fitted into a separate box with the power supply. So for £399 you get the keyboard plus disc box which can be used with a TV set. For £70 more you get a monochrome monitor. For £599 you get a medium resolution (Philips) colour monitor. Note that prices exclude VAT – you can blame that on Amstrad's success.

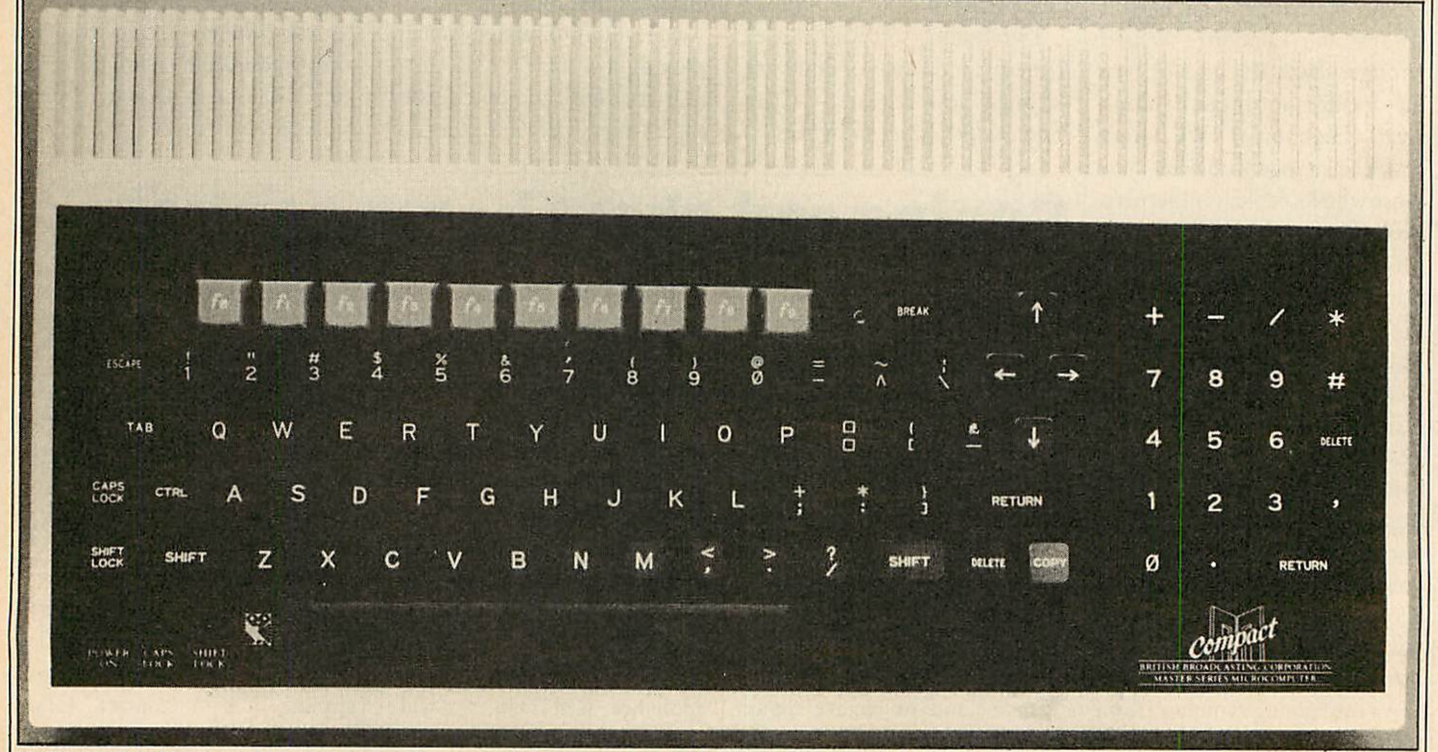
The theory of all this is similar to that of the Electron. However, the Electron not only lost all the interfacing, but also the software compatibility and speed. And it never came out on time. The Compact appears to have hit on a good compromise – the power of the Master but equivalent to £250 cheaper. It has all the interfaces needed in the home and by small businesses, all the software compatibility (apart from the disc medium), and

Master Compact 128
£399 plus VAT *(includes single 3.5in disc drive)*
Compact plus monitor
£469 plus VAT *(as above, but with monochrome monitor)*
Compact plus colour monitor
£599 plus VAT
Each includes *View*, Logo and *ABC* software.

Acorn appears to have set up stockpiles for the launch. As long as Acorn gets the advertising and distribution right there should be no problem selling it.

And what about the Amstrad? The Compact doesn't come with a printer, but then it's more than a wordprocessor. It comes with the *View* wordprocessor built in, but it also has Logo for teaching and a children's writing package. And that's the key to Acorn's strategy, to sell it to parents who want to teach their children about computers. The Amstrads can't do that.

What are the disadvantages? First, it comes with 3.5in disc drives. These are the coming thing, but there isn't much software around on them yet – although Acorn has persuaded companies to back the machine with 100 titles available from the launch. Next, it doesn't have a user port, 1MHz bus, analogue port or RS232 fitted. But don't despair, the analogue port and user port have been chopped down to become a joystick/mouse interface, with an 'Atari-type' connector. And the RS232 can be added (it's just four extra chips) to take a modem. An Econet socket is there, but an in-



A 'Baby'-sized keyboard for the Master Compact 128 – it's about half the size of that of the Master or BBC micro



The Master Compact: top of the range model with colour monitor plus disc drive

terface must be plugged in as on the Master. The sockets are fitted, but blanked off. If you want a proper 1MHz bus/user/analogue port, then you'll have to purchase a Master.

Also, the Compact doesn't have sockets for either internal co-processors or external second processors. This means it can't be upgraded to the power of the Master Turbo or the 512 with its IBM compatibility.

The Compact will give the whole BBC market a much-needed boost, if only because it should get BBC software and hardware back into the major retailers and put the name in front of the computer industry. It might well help the Electron particularly as 3.5in drives were used in the Electron Plus 3 disc drive add-on.

One of the most fascinating things about the Compact is going to happen in Italy.

Olivetti is to launch the machine in Italy as one of its own called the Prodest. Italy is some way behind the UK in micro penetration (they're mostly Commodores apparently) so with Olivetti behind it, the machine should do great things for Acorn's bank balance. Could Olivetti sell more than Acorn? It will be interesting to see the results.

The machines will be built in England by Rank Xerox in Hertfordshire initially.

Acorn's target is the home market. Not a strict games market, but following on Acorn's success in education, while putting the Amstrad side of business into the nation's front room as well. The BBC micro sold, but the Master was too expensive. This is Acorn's way of putting that right.

Bruce Smith takes the lid off the Compact – page 15

Discs tie-in with launch

Over a hundred software titles were set for distribution on 3.5in disc format for the Compact launch. Acornsoft and Superior have jointly launched ten games, with more to come.

Some of the other publishers fired up for the launch include BBC Soft, Tynesoft, Micro Power, Kosmos, 4Mation, Fernleaf, Medstat, AMS, Clares and Computer Concepts.

Details from Dept 3P, Acorn, 645 Newmarket Road, Cambridge CB5 8PD.

The new BBC micro allows your child a bit of growing room.

Ample room to accommodate your child's learning development.

The BBC Master Compact's educational software, takes children from their first grasp of words and numbers to A-level and beyond.

In 84% of U.K. schools, children are already growing up with BBC micros.

With a BBC Master Compact at home, your child's ability with computers will progress by leaps and bounds.

Before too long, you may find that you have a Businessman of the Year in the family. At which stage, our micro could well be handling your young tycoon's financial planning and forecasting.

Accountancy Age has already acclaimed our spreadsheet package as 'the most sophisticated yet produced for a small micro'.

The BBC Master Compact manages to fit the BBC micro's benefits into one, easy to use package. This includes colour monitor, processor, disc drive and enough software to keep you and your children busy indefinitely.



It is now available from main computer dealers.

You owe it to yourself to buy them something they won't grow out of easily.

AVAILABLE FROM SELECTED BRANCHES OF CURRYS, DIXONS, JOHN LEWIS, LASKYS, W.H. SMITH AND YOUR ACORN DEALER.
THE MASTER COMPACT 128K RAM, 3.5" DISC DRIVE, PRINTER AND JOYSTICK INTERFACE. SOFTWARE INCLUDES VIEW WORD PROCESSOR, ABC, CARD INDEX, LOGOTRON LOGO, WINDOW-DRIVEN DESK-TOP SYSTEM, ADVANCED DISC FILING SYSTEM, 14 PROGRAM WELCOME PACK AND 4 TUTORIALS, SPREADSHEET EXTRA AT £52. BASIC PRICE £399. WITH MONOCHROME MONITOR £469. WITH HIGH RESOLUTION (0.42 PITCH) COLOUR MONITOR (AS ABOVE) £599. ALL PRICES PLUS VAT. FULL DETAILS FROM BOB COATES, DEPT (AU1), ACORN COMPUTERS LTD., CAMBRIDGE TECHNOPARK, 645 NEWMARKET ROAD, CAMBRIDGE CB5 8PD.



The BBC Master Compact.

Equips your child for life.



Advanced Computer Products

NEW PRODUCTS

ADVANCED **P**RINT **B**UFFER is a program that runs in sideways RAM and provides a large printer buffer, instead of the resident 63 bytes. Large means over 14K (14 700 characters) allowing letters, reports, documents, listings etc. to be printed whjile you carry on with another task. Full control is provided to switch buffer on/off, purge buffer, even changing the effect <ESCAPE> has on the buffer (essential when using w/prox such as View) **(5¼ A/DFS) /B/M/C £5.95**

ADVANCED **E**LITE **F**S allows Master users to run their BBC Elite program disk on the Master or Master Compact **(5¼ ADFS) /M/C £5.95**

ADVANCED **BBC** **D**FS E00 enables B+ or upgraded B users to run 1770 DFS at @ E00 when used in 16K sideways RAM **(5¼ DFS) /B+ £5.95**

The following ACP products:
Advanced Disc Toolkit
Advanced Disc Investigator
Advanced ROM Manager
Advanced 1770 DFS
are all Compact compatible

ADVANCED DISC TOOLKIT
(01) /M/B/E **£34.50**

Any Acorn user including Master, BBC B+, Electron, DFS, 1770 DFS, ADFS, 2nd. & co-processors A.C.P.'s BEST SELLING product containing over 30 commands inc.:- powerful memory & disc editor, search memory/disc/basic, catalogue/unplug ROMS, load/run programs below page, automatic menu, file transfer (inc. locked cassette files), ADFS utils etc. etc. ("it's superb" ... Database Pubs. - "excellent value for money" .. Acorn User) (16K EPROM & FULL MANUAL)

ADVANCED ROM ADAPTOR 2
(03) /M/E+1/ **£14.95**

An Acorn approved cartridge containing a card with special 'zero' profile sockets that allow you to fit compatible 8K or 16K EPROMS/ROMS. The cartridge is fully enclosed providing complete protection for your ROMS. Simple to use -no switching- complies fully to the Acorn (sideways) Rom Filing System. A.R.A.2 contains 2 sockets.... A single adaptor is also available....
A.R.A.1 (02) /E/ £10.35

ADVANCED SIDEWAYS RAM
(04) /E+1/ **£29.90**

A highly versatile but simple to use s/w RAM cartridge that is automatically write protected on loading. Contains 16K RAM but can be switched (externally) to 2 X 8K RAM. Supplied with instructions & full software support (on cassette) to save ROM images to disc/tape, load RAM from file, Advanced Print Buffer & MakeRom a utility to merge several files from disc to be run from the ROM FS.
(S/Ware on disc : please add ...
£1 5¼ DFS .. £2 3½ ADFS)

ADVANCED ELECTRON DFS
(05) /E/ **£24.15**

Electron & Plus 3 users ... gain BBC compatibility by adding the Advanced Electron DFS (1770 DFS) this is the same disc filing system supplied with the BBC B+. Now you can produce and access (compatible) BBC disc based software. A.C.P. also supplies 5¼" disc drives to add to your Plus 3 (inc. 2nd. drive adaptor). "ACP has produced another superb ROM for the Electron" .. Electron User Feb '86
(supplied on 16K EPROM + DFS MANUAL)

ADVANCED DISC INVESTIGATOR
(06) /M/B/E/ **£28.75**

A very powerful Disc utility for standard & non-standard discs. Backup most protected discs, edit any type of non-standard disc, check & repair faulty tracks, create new disc formats, copy 40track discs to 80track discs, verify two non-standard discs.
("ADI features an extremely comprehensive sector editor, and one of the finest I've seen" ...Tubelink on Prestel)
(supplied on 16K EPROM + manual)

ADVANCED ROM MANAGER
(07)/M/B/E/ ***£14.95***

A friendly utility for ROM & sideways RAM. Examine ROM/RAMs, load files into RAM, move memory to/from SWays ROM/RAM, catalogue/kill ROMS, offer commands to specific ROMS, save ROMs to disc/tape, AUTOROM a file (inc. BASIC) to run from SWays ROM/RAM, execute specific machine code subroutine in a ROM, generate a ROM's checksum & CRC.
ON ALL ORDERS RECEIVED AFTER 29TH AUGUST
(supplied on EPROM + manual)

ADVANCED PLUS 4
(08) /E+1/ **£79.98**

"DISC DRIVE COMPATIBILITY AT LONG LAST"... (Electron User June '86) this sums up AP4 & ACP's approach to producing products. AP4 is a fully ACORN compatible disc I/face & will accept any standard drive inc. PSU, runs 1770 DFS (as fitted in the B+ & Master), keeps page &Eøø, utils in ROM & provides a spare rom socket. "ACP's PLUS 4 comes out on top. I can recommend it to any-one..." (E.U. June '86)
...AP4 should be considered the standard interface for the Electron (AU July '86)
AP4 100 £198.97 (inc VAT & delivery)
AP4 400 £228.98 (inc VAT & delivery)

ADVANCED PLUS 5
(09)/E+1/ **£66.70**

A triple interface cartridge providing...
1) a TUBE i/face allowing a second processor to be connected, increasing BOTH speed & memory (PAGE &8øø HIMEM &8øøø in all modes)
2) a 1 MHz BUS for control applications & prommers
3) the USER PORT for mouse and graphic devices.
Also contains 2/3 ROM sockets and on board operating software for 2nd processor.

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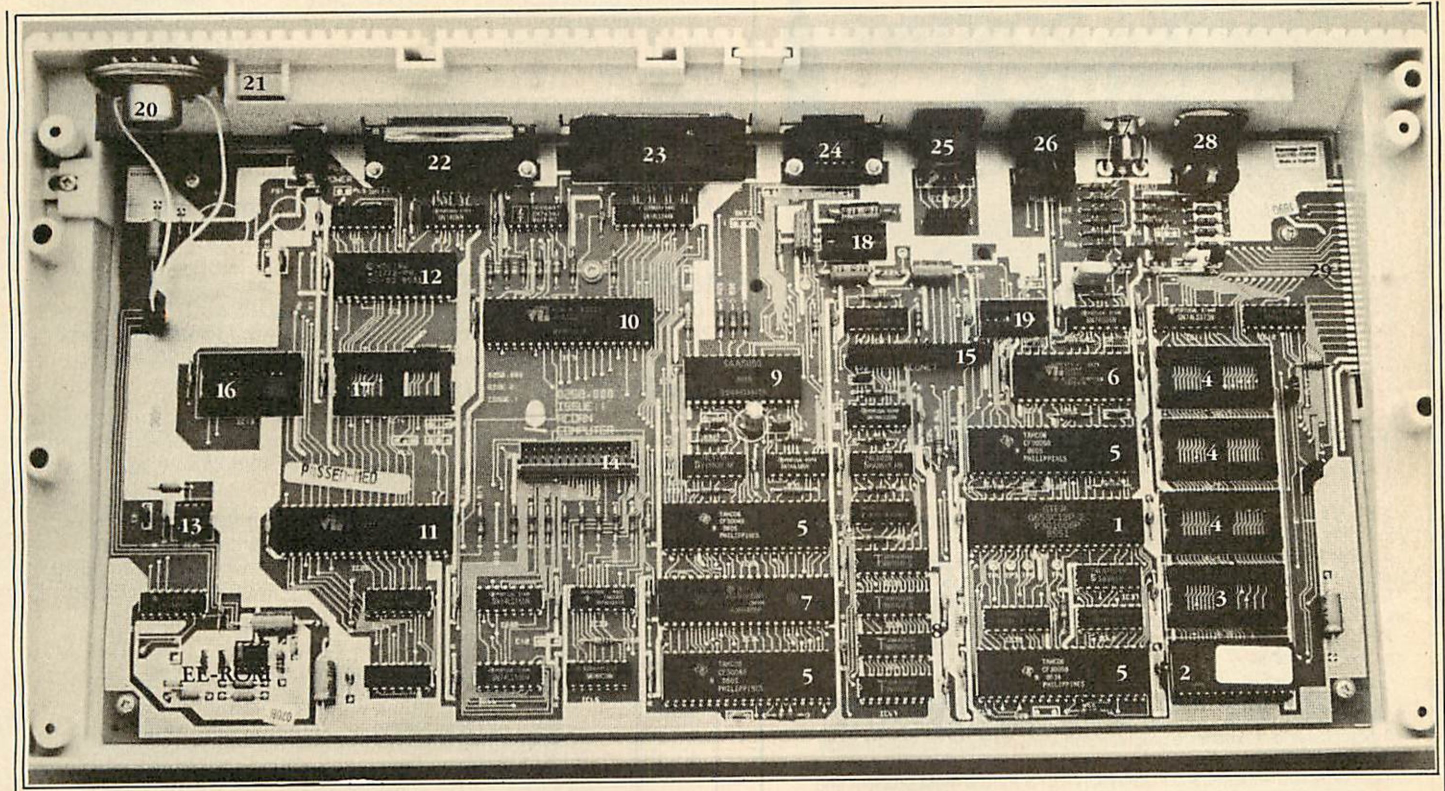
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Taking the lid off the Master Compact

Hardware key

1 65SC12 micro processor
2 MOS – 64k
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4 16k ROM sockets (*3)
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6 Video processor
7 6845 Cathode Ray Tube Controller
8 128k RAM (4*32k chips)
9 Teletext chip
10 User 6522 VIA
11 System 6522 VIA
12 1772 Disc Controller Chip
13 EE-ROM
14 Keyboard connector
15 Econet board connector (*2)
16 Serial Uart (upgrade chip)
17 Serial upgrade chip
18 RS232 driver/receiver chip (serial upgrade)
19 Serial upgrade chip
20 Speaker
21 5V power supply input
22 Disc connector
23 Printer connector
24 Joystick port
25 Econet socket
26 RS232 socket
27 Video output
28 RGB socket
29 Expansion connector

by Bruce Smith

The Master Compact is supplied in two boxes (three if you've ordered a monitor) which are connected together as follows:

● Keyboard and main printed circuit board containing microprocessor, ROM, RAM, specialist chips and sockets and ports.

● Disc drive – a 3.5in drive running under ADFS and connected to the keyboard by a length of ribbon cable. The box also contains the Compact's power supply unit with mains switch on rear. A single 3-pin plug supplies mains power and avoids the 'spaghetti' of leads that most of us have been brought up to believe is a must for any good computer system! Acorn anticipates offering a second disc drive as an upgrade. No price is available at present but it will probably be over £100.

● The disc box also acts as a monitor standard for either a TV, a monochrome or RGB monitor.

● Monochrome monitor (£469) or RGB monitor with sound output (£499).

The keyboard

For the Compact, Acorn has dispensed with the traditional BBC computer keyboard with switches underneath the keys and gone for a rubber-plastic moulding membrane. This is not quite as awful as it sounds – in fact I personally prefer it for feel to the keyboard supplied with the Master 128 – though both are far inferior to the old BBC micro keyboard. The key layout is as for the Master 128, including numeric keypad.

The keyboard is housed in a rather tasteful case which is not dissimilar to that used for the Communicator. Directly underneath the keyboard is the main printed circuit board (PCB) housing all the computer's circuitry (see above).

The main board

Although essentially a cut-down Master 128, the main printed circuit board of the Master Compact has been completely redesigned. The chip count has been kept down to just 41 and the board is spacious.

The processor is a 65SC12 – the same as on a standard Master 128. 128k RAM is permanently supplied, arranged as 64k main RAM and 64k sideways RAM. A notable difference is that this sideways RAM is permanently available and cannot be masked out with extra ROM slots by setting links as on a standard Master 128.

A 50-way expansion connector protrudes from the right-

hand side of the keyboard case. The edge connector is similar in terms of pin order and signals to cartridge socket 3 on a Master 128. Thus it is theoretically possible to add external sideways ROM or RAM expansion. Paged ROMs would be mapped as sockets 0 and 1.

Many of the standard Master CMOS gate array chips are in place, including the memory controller, the cathode ray tube controller multiplexer, the memory controller and peripheral bus controller.

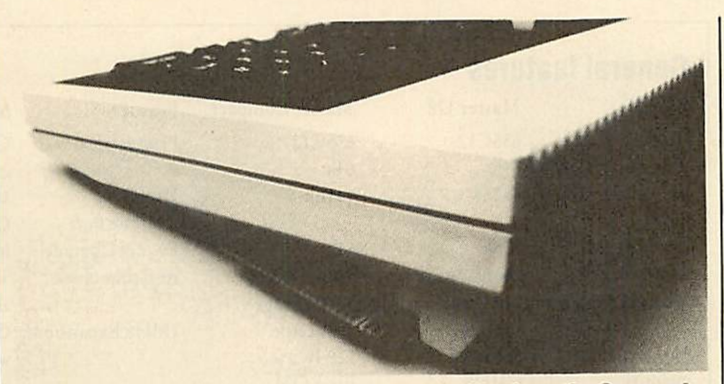
The right-hand side of the board is flanked by five sockets, the bottom of which is the 64k ROM containing the Compact's firmware. This socket does have a 128k capability selectable via a standard link. ROM slots &9 to &F appear in the 64k ROM, though ROM slots &D and &F are mirrored in &9 and &B unless 128k ROM is fitted.

These four sockets are free for ROMs and EPROMs, the upper three being 16k capacity and the fourth 32k. These appear as ROM slots 0/1, 2, 3 and 8. Sideways RAM appears in slots 4 to 7. Slot &C is not used.

There is no real-time battery backed clock with the Compact. Status and configuration bytes are implemented however, by the use of an EE-PROM chip. This small device contains 128 bytes which are written to and erased electronically.

Disc control is provided by the 1772 chip – this is a slightly faster version of the 1770 chip which Acorn supplies with the Master 128 (though later machines are fitted with a 1772).

The rear of the board houses all the standard ports for the Compact for use with printers, disc drive etc. The ports are non-standard compared to previous BBC machines – however this is not a ruse on Acorn's behalf but intelligent foresight to allow the Compact to comply with possible new radio frequency interference requirements.



Note the 50-way expansion connector protruding from the Compact

No hardware provision is made to support either a cassette interface or a TV UHF output, though an external colour matrix/modulator can be attached to the video socket.

There is no hardware support for the standard Master analogue port, however a digital (Atari-style) joystick may be connected via the joystick port on the rear of the case. The MOS firmware converts the joystick output into suitable ADVALs to allow emulation of a standard BBC micro joystick operation.

The serial port is an optional extra. Upgrade to the RS232 port is performed simply by the insertion of four chips and pushing out the rear socket cover to expose the serial port socket. No hardware provision of any kind is made to support a modem upgrade.

A standard Centronics printer can be attached via a 24-way Delta socket – printer leads are therefore not directly interchangeable between BBC Master and Compact, though small adapting leads can be fabricated if desired.

Provision is also made for the installation of an Econet board internally – fitting to the rear right of the main PCB – and insertion of the ANFS ROM.

Second or co-processor expansion is not possible, nor is access to the 1MHz bus hardware and software support is removed from the Compact. As is evident from the photograph below, there is no provision for a User Port though some lines for the User 6522 VIA are present on the joystick port including the light pen strobe input (LPSTB) line.

The 64k ROM

The 64k ROM contains a 32k machine operating system (MOS version 5), Basic 4(1986) and version 2.0 of the Advanced Disc Filing System (ADFS). Typing *ROMS shows that these are ROMs F, E and D which show up as UTILS, Basic and ADFS on the ROM list.

The Master 128 MOS has had to be pruned down from 35k to allow it to fit into the 32k available. This has been done by cutting out code responsible for handling of input/output (I/O), Tube, and other hardware now not present. Sideways RAM commands such as *SRLOAD, *SRWRITE, etc, which previously lived in the DFS ROM have been re-housed in the new slim-line MOS.

ADFS version 2.0 is the same as earlier releases with the addition of format, verify and backup commands now in ROM. To allow for this, the Winchester handling code has had to be removed – but as the Compact has no 1MHz bus, a Winchester hard disc cannot be accommodated anyway.

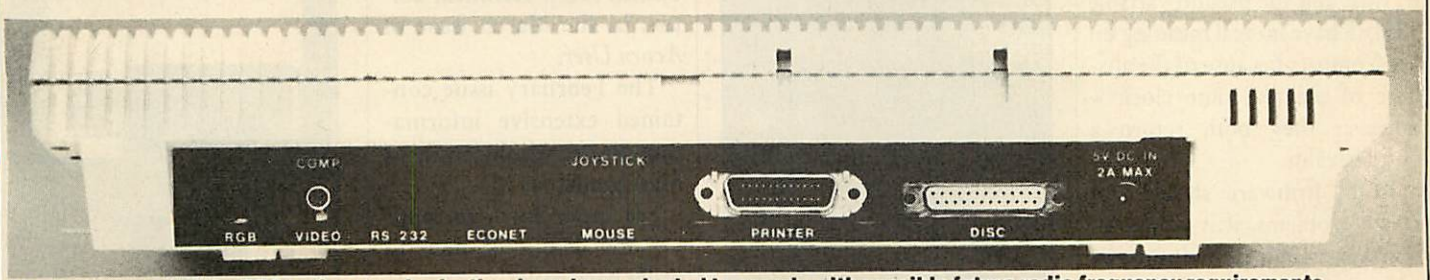
Basic 4 is virtually the same as supplied on the Master, except that the mathematical functions have been re-coded to give in excess of a 30 per cent speed increase. It is called Basic 4(1986).

View/Logo/ABC

Acornsoft's *View* wordprocessor and Logotron's Logo are supplied on the 'Welcome' disc in the form of ROM images which can be loaded into a bank of sideways RAM and used as normal. *View* is version 3.2 and is supplied with its own printer driver which is installed automatically.

The choice of Logotron Logo in preference to Acornsoft's own Logo may raise a few eyebrows. However, remember that the Acornsoft Logo is geared very largely to driving turtles which is beyond the capability of the Compact.

The award-winning child's wordprocessor *ABC* is also supplied, along with a program which will convert *ABC* text files into *View* format.



The ports are not of the BBC series standard – they have been adapted to comply with possible future radio frequency requirements

The Welcome disc

Acorn provides a very nice front end to the Compact. This is supplied as icon-driven software on the 'Welcome' disc. When the 'Welcome' disc is run you find yourself in a desktop environment from which you can move a pointer to select applications software, games, tutorials, utilities or graphic displays. Selections are made by moving a pointer to the named box and pressing the Return key which reveals a pull-down menu from which a final selection may be made. Applications include a card index file, a calculator, a 16-page note pad and clock display.

Many of the other programs on the 'Welcome' disc will be familiar to Master owners as these include the Control Panel which allows setting of configuration bytes which define start up options, plus other favourites like the pattern and envelope editor.

Compatibility

Acorn has put a lot of effort in behind the scenes to ensure software compatibility, with over 100 software titles available for the launch of the Master Compact. In general probably the biggest barrier for anybody wishing to port their own software across is the limitation to 3.5in discs and the use of ADFS. However, any item of software working on the Master 128 that does not take advantage of the peripheral hardware should work first time on the Compact.

The absence of sections of MOS coding should not cause any errors with Osbyte calls returning values to the effect of not being present. The command *TIME and the pseudo variable TIME$ have no real meaning on the Compact because of the absence of the real time clock – however they both return a dummy value.

ROM firmware should not create problems, if it works on the Master 128 it should work on a Master Compact.

General features

Feature	Master 128	Master Compact
CPU	65SC12	65SC12
Fitted user RAM	64k	64k
Fitted sideways RAM	4*16k	4*16k
Fitted ROM	128k	64k
ROM sockets	1*16k,2*32k	3*16k,1*32k
Memory expansion	2*44-way cartridge sockets	50-way edge connector
Non-volatile memory	50-bytes CMOS	128-bytes EE-ROM
Screen modes	0-7+shadow modes	0-7+shadow
RGB output	Yes	Yes
Composite video	Yes	Yes
TV UHF	Yes	No
Analogue Port	4 Channel A/D	No
Disc interface	Shugart34-wayIDC	Shugart 25-way D
Serial port	RS423	RS232

Feature	Master 128	Master Compact
Printer port	Centronics 26-way IDC	Centronics 24-way delta
User Port	10 I/O bits	7 I/O bits
Cassette Port	CUTS relay	No
Econet Upgrade	Module, ANFS	Module, ANFS
Real time clock	Time, calendar and battery	No
1MHz Expansion	Cartridge and 34-way expansion bus	PCB Edge connector (at 2MHz)
Tube expansion	Module/40-way IDC	No
Sound output	4 channel 8R speaker	4 channel 16 speaker
Firmware in ROM	MOS 3.2, Basic 4, ADFS, DFS, View, ViewSheet	MOS 5.0, Basic 4, ADFS View, Logo
Firmware on disc	None	ABC, Welcome disc, Desktop
Software	Welcome disc	

ROM socket equivalents

Master Compact	Maximum size	Slot number	Master 128
IC38	32k	0,1	Cartridge (sk3)
IC23	16k	2	Cartridge (sk4)
IC17	16k	3	Cartridge (sk4)
IC29	16k	8	IC27

Master joystick pinout

6522 User VIA names	Master Compact pin	Master 128 User Port
CB1	5	2
CB2	9 (LPSTB)	4
PB0	6	6
PB1	3	8
PB2	2	10
PB3	1	12
PB4	4	14
PB5	(Expansion bus, 22a)	16
PB6	(Expansion bus, 21a)	18
PB7	(Expansion bus, 20a)	20
0V	8	5-19 odd numbers
5V	7	1,3

This table allows you to compare the features of the Master Compact with those of the Master 128



Master

Full details of the Master 128, on which the Compact is based, were carried in an in-depth review by Bruce Smith, *AU*'s technical editor, in the March issue of *Acorn User*.

The February issue contained extensive information on the whole family of Master micros.

See order form on page 129 for details of how to order back issues.



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MD402E

MD802F

MD400G

MD200A

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MD200B	SINGLE 200K 40T DS PSU	£129.95	MD802G	DUAL 800K 80T 3.5″ DS PSU	£225.95
MD400B	SINGLE 400K 40/80 T DS PSU	£154.95	HD2000	20MB HARD DISK WITH PSU	£799.95
MD402C	DUAL 400K 40T DS DD	£209.95	HD4000	40MB HARD DISK WITH PSU	£1299.95
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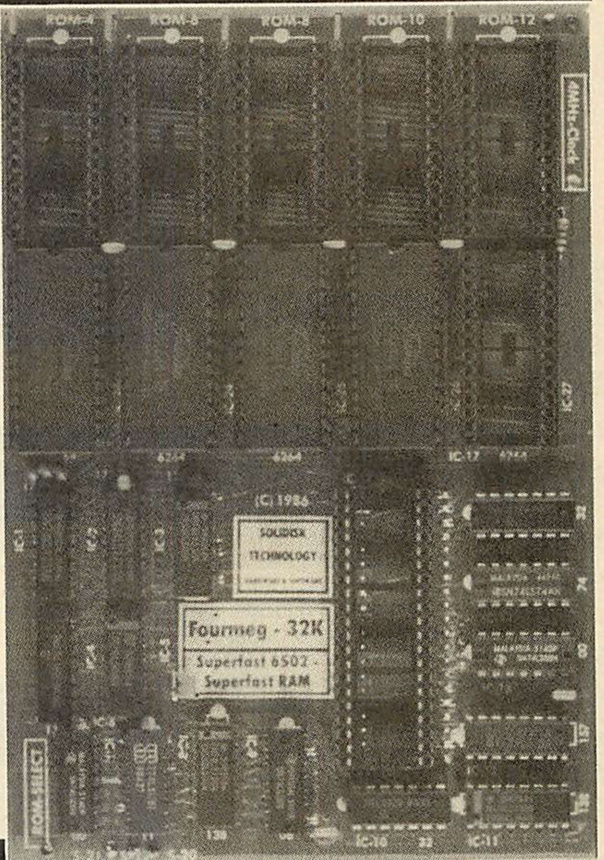
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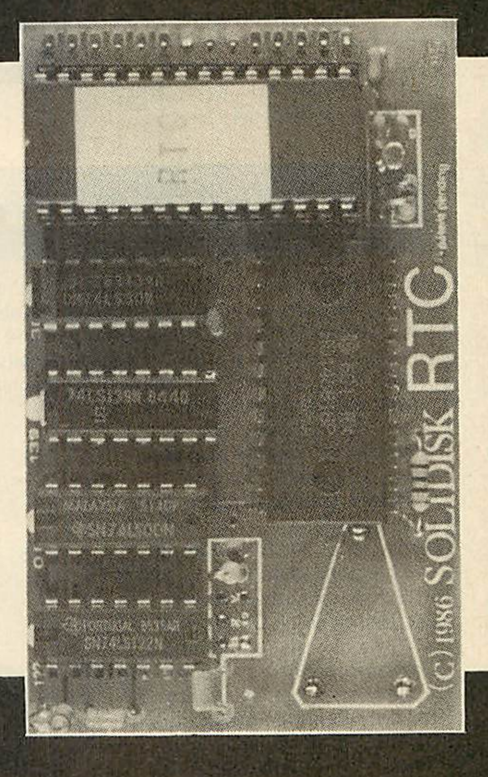
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This board, the TWOMEG-32K, is specifically designed with the SCHOOL BEEB in mind so that one could have everything one wanted on a single, compact and extremely easy to install unit. All the necessary software is in a MANAGER ROM (supplied).
The top row of FIVE ROM sockets will take software ROMs, up to 32K each such as used on the BBC Plus and MASTER 128.
The middle row contains 32K of additional CMOS, low power RAM, acting as SHADOW RAM or as two banks of SIDEWAYS RAM.
The empty 40 pin socket will receive either the normal 2MHz CPU or the optional enhanced, faster 4MHz CMOS 65C02 (the board will be then called the FOURMEG-32K).
The TWOMEG-32K combined the usual functions of a Sideways ROM board — offering storage for up to 160K on board and 64K on the Beeb itself (a total 224K out of 256K possible) and a SHADOW RAM compatible with major 'language ROMs' such as BASIC, VIEW, WORDWISE, INTERWORD, VIEW-SHEET, VIEW-STORE etc.
When Shadow RAM is in use, a small 8K of Sideways RAM is available for loading ROM images or a small printer buffer. When SHADOW RAM is not in use, the entire 32K additional RAM can be used as TWO banks of SIDEWAYS RAM or as a RAM DISC (available only with Solidisk DFS or ADFS).
The MANAGER ROM also contains a powerful TOOLKIT to assist PROGRAMMING IN BASIC.
The attraction of the TWOMEG-32K board comes from its versatility, its convenient software in ROM and its low price tag. Furthermore, the board can be fitted with a CMOS 65C02 capable for example of running the new BASIC 4 (some 30% faster than BASIC 2 and also more accurate) or upgraded to FOURMEG speed, comparable to the TURBO board on the MASTER.

TWOMEG-32K £50.00
65C02 (2MHz) for the above £10.00
Or upgrade to FOURMEG £25.00
FOURMEG-32K £70.00

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Many additional commands are background commands, leaving your computer free to run your program. They set the time, display the clock in any screen mode, bleep at specified time, interrupt and show a message when you have an appointment, perform a specified task at specified time etc.
You can even 'Clock Boot' your computer directly into the DESKTOP, using the MOUSE you can operate the computer without touching the keyboard (ATARI-ST style) until you 'click' on a language ROM or an application program. You can pop down the pocket size calculator, change the time and edit your DIARY (instead of using a word processor).
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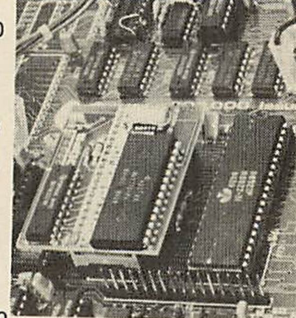
In Brief:

The range of Solidisk Add-Ons for the Beeb is quite extensive. For example: TWOMEG-32K . . . £50.00, FOURMEG-32K . . . £70.00, SWR64 with S/W pack 1 . . . £60.00, SWR128 (new style) with S/W pack 1 . . . £80.00, FOURMEG-256K with WORDWISE PLUS . . . £175.00, DDFS (1770) . . . £35.00, DFDC (1770+8271) . . . £40.00, DFS 2.2 ROM . . . £15.00, ADFS 2.1 ROM set . . . £30.00, 3½ inch (80 track double sided) drive . . . £90.00, 5¼ inch drive . . . £109.00, 20MB Winchester with PSU . . . £745, Linemaster communication ROM . . . £10.00, Insight intelligent disassembler ROM . . . £15.00, Solimon machine code monitor ROM . . . £10.00, Toolkit ROM . . . £10.00, S/W pack (1 to 3) of 5 discs . . . £10.00, 2764 EPROM . . . £1.00 each, 27128 . . . £3.00, 27256 . . . £6.00, EPROM programmer for 2764/27128 . . . £19.00, EPROM programmer for 27256 . . . £21.00, EPROM Eraser . . . £20.00.

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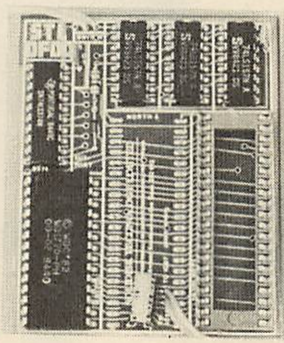
Double density disc interface



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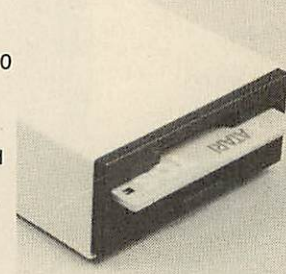


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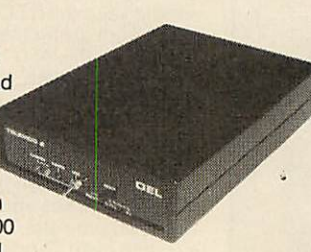


Single and double density disc filing system ROM version 2.2

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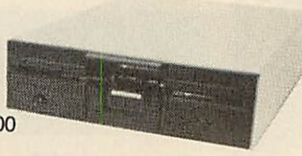
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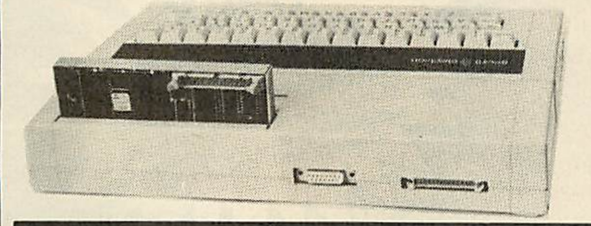
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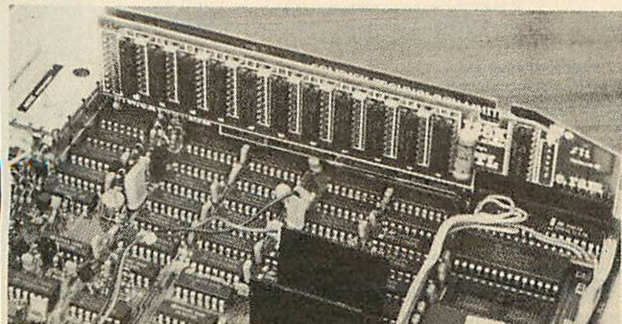
Electron Disc Interface:

This unit (EFS) plugs into the PLUS-1 Expansion and allows connection of a twin disc drive system and a Winchester. The Disc Interface is based on the same WD1770 chip as used on the Beeb.
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Most burglaries happen during the day, so the Red Boxes control system works just as hard then as it does at night.

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Turn your home computer into a command terminal.

The Red Box starter system comprises three red boxes.

RED LEADER is a complete 6502 based microcomputer with 16 kbytes ROM, 8 kbytes RAM, peripheral controller with 2400 baud mains modem and host computer link, with an integrated power supply. Its powerful micro-processors turn your micro-computer into a command terminal. This is the heart of the system – its even sophisticated enough to recognise which type of computer you own!

RED ONE is a micro-processor controlled 13 amp mains outlet working under the supervision of Red Leader. With Red One at a socket you have power over domestic appliances and lights connected to that outlet.

RED TWO is a complete micro-processor controlled movement detector which feeds back data to Red Leader via mains borne signals – raising the alarm on intruders as soon as they enter its heat seeking zone.

Unique tamper-proof security.

Our Red Boxes operate a secure communications protocol. Incorporating tamper-proof PIN codes. All 'slaves' – outlets, sensors, switches – are first introduced to Red Leader using their own secret 24 bit address. Secret 'keys' are assigned to every device – lights, TV etc., known ONLY to you, and messages between devices are also encoded using random numbers to further secure the system.

No other Red Leader knows your slave codes; therefore no unauthorised person can interfere with the operation of your system.

Computer to computer communication.

Communication is a vital aspect of our Red Boxes system.

Controllers are not isolated from one another – they are connected with each other, through the mains borne system and so communicate with each other and with Red Leader. If Red Two sends a message to Red Leader indicating an intruder, Red Leader responds by telling a switch unit to activate the alarm.

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The possibilities are endless.

Our Red Boxes are ready for them. With humidity detectors, sensors or additional motors, this system can be used for weather monitoring, aerial rotation, home brewing, greenhouse thermostat control, keyless access via electronic door locks, remote access control via a telephone modem – even a robotic arm for performing simple mechanical tasks like tea making and shoe polishing. One day we might even invent one to iron shirts, why not.

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For a FREE 14 day trial of the Red Boxes control system WITHOUT OBLIGATION complete the coupon and post to: Electronic Fulfilment Services Ltd., Chesterton Mill, French's Road, Cambridge CB4 3NP.

Your Red Boxes control system will be delivered within 28 days and if you are not delighted for any reason just return it to us for a full refund.

The Red Box starter system costs £129.

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Also include: ____________ Project Manuals at £9.95.
____________ additional Red One control boxes at £36.95 each. (inc. £2 p.&p.)
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Name____________
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RED leader

RED one

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RED BOXES

A.I.

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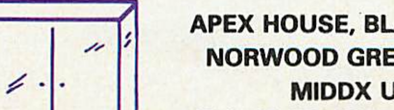



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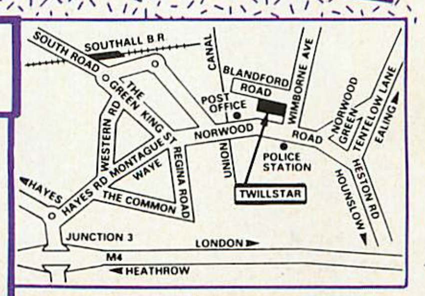
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INTER-WORD

The latest word processor from the same stable as WORDWISE and WORDWISE PLUS, the most successful programs ever written for the BBC Micro computer. With years of experience and feedback from users, the authors of INTER-WORD have ensured that it suits everyone's needs. A great deal of attention has been paid to ensuring that INTER-WORD is fast, efficient and above all simple to use. Being menu operated the newcomer does not need to remember strange key combinations or command names. The menus are not a burden to the experienced user since there are shortcuts to access many of the features.

REVIEWS

"the most significant program since WORDWISE." ... "INTER-WORD on the BBC Micro compares favourably with word processors costing five or ten times as much on the IBM PC and the like." ... "INTER-WORD is a real pleasure ... a truly worthy successor to WORDWISE"
Gordon Taylor A&B Computing

"Rulers can be used to manipulate text to your satisfaction. This is a joy to use."
"INTER-WORD is certainly an advance on most other word processor packages."
Popular Computing Weekly, July '86

Technically, too, the program is astounding..."
"...quite stunning handling characteristics"
Viewfax Tubelink—August '86

"INTER-WORD is the most powerful and comprehensive word processor available for the Beeb today. It is more powerful and flexible than View and still retains much of the friendliness and ease of use of Wordwise. Inter-Word looks set to become the standard word processor for the BBC Micro."
Beebug, Aug/Sept '86

Some of its special features are:

•Automatic re-formatting
This enables the user to just type - no keys to press to re-format the paragraph after changes to the text or margins have been made; the margins on the rulers can simply be dragged, all text being instantly re-formatted to the new settings.

•Multiple documents in memory.
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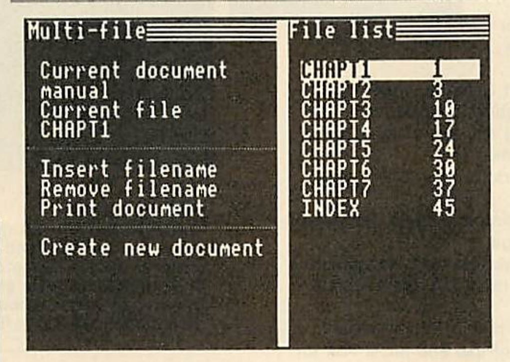
•Multi column
Built in facilities for printing text in up to 5 columns.

• Pull down menu operation
Simple and fast selection of all INTER-WORD options and page layout.

20% discount

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•Multi-file operation
Very large documents can be handled with ease. INTER-WORD's unique multi-file mode puts virtually no limits on document size and allows simple and fast movement to any point in the document.

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These are common to most word processors, but with INTER-WORD any part of the text can be marked and then instantly moved, copied, deleted, printed, saved, underlined etc. There is no limit to the amount that can be marked.

•Specific page printing
Any page or range of pages may be printed, even in multi-file mode, with any number of copies.

•File selector
The file selector displays a list of all files - move to one and select it. You will never have to type or remember filenames again.



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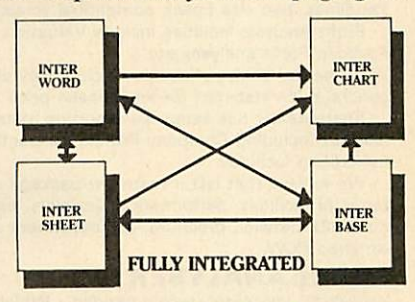


Computer Concepts

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•On screen style changes
Underline, bold and a special 'dotted' style are shown on screen exactly as they would appear on the final printout. Also left, centred and right justified text is shown on screen as you edit. What you see on screen is really what you get on the printout.

•On screen page breaks
You need never lose your place on the page. Top and bottom spaces, with any associated headings, footings or page numbers etc. are shown at all times. Like most features in INTER-WORD, a menu option lets you turn paging off.



•Integrated spelling checker
To be made available soon, this entirely ROM based spelling checker allows text to be checked as it is typed or after typing, at over 9000 words per minute.

- **•40,53,80 and 106 column screen modes**
- **•Mail merge**
- **•Integrates with all other parts of INTER family**
- **•Automatic page numbering, with headers and footers**
- **•Very fast and smooth scrolling**
- **•Powerful search and replace facilities including wildcards, upper/lower case sensitivity, stored search and replace strings for instant re-use.**
- **•Automatic word count**
- **•Fast simple cursor movement to any point**
- **•Easily tailored to any printer**
- **•Line numbering**
- **•Selectable screen colours**
- **•Compatible with the B, B+ and Master; Solidisk, Aries and Watford shadow RAM boards.**

Software is now more important than the hardware, especially with todays falling hardware prices.

INTER-WORD is the most sophisticated and professional word processing package available for the BBC Microcomputer.



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Ribbon....................£6 (d)

JUKI 6100
RS232 Interfaces....................£65 (d)
Tractor Feed....................£129 (a)
Ribbon (Carbon)....................£2.00 (d)
Spare Daisy Wheel....................£14 (d)
Sheet Feeder....................£182 (a)

BROTHER HR15
Daisy Wheel....................£18 (d)
Tractor Feed....................£90 (a)
Ribbon (Carbon/Nylon)....................£3.00 (d)
Sheet Feeder....................£182 (d)
Keyboard....................£135 (a)

Printer Leads:
BBC Parallel Lead (1.2m)....................£6 (d)
BBC Serial Lead (1.2m)....................£6 (d)
Other lengths can be supplied on order:
IBM Parallel Lead (2m)....................£12 (d)

PAPER & LABELS
Plain Fanfold paper with micro perforations:
2000 sheets 9½" × 11"....................£13 (b)
2000 sheets 14½" × 11"....................£18.50 (£4.50)

Labels/1000:
Single Row 3½ × 1 7/16"....................£5.25 (d)
Triple Row 27/16" × 17/16"....................£5 (d)

BBC SPARE PARTS

All Prices are Retail ex-VAT

BBC & Misc:		8271	£46	74LS10	£0.24
Keyboards	£52	88LS120	£3.00	74LS123	£0.80
Powers Supply	£52	**BBC PLUS:**		74LS163	£0.75
Keyswitch	£1.75	PAL16REN	£13.50	74LS244	£0.80
Video ULA	£18	64K × 4 DRAM	£8.50	74LS245	£1.10
Serial ULA	£14	6512A	£12.50	74LS373	£0.90
DNFS	£18	SAA5050	£9.00	74LS393	£1.00
UHF MOD	£4.50	6845SP	£6.50		
6502A CPU	£6.50	UPD7002	£5.00	**BBC MASTER:**	
65CO2 CPU	£12	DS3691	£3.50	1-Mbit ROM	£39
6522 VIA	£3.50	7438	£0.40	MSI CHROMA	
6522A VIA	£5.50	74LSOO	£0.24	IC	£13.50
LM324	£0.45	74LSO4	£0.24	65SC12P-2	£12.50

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TECHNOMATIC

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305 Edgware Road, London W2 Tel: 01-723 0233



For price details see page 1.



BRITISH BROADCASTING CORPORATION
MASTER SERIES MICROCOMPUTER

THE FAMILY COMPUTER

Now available from stock

This low cost high tech computer has developed specially as a computer for home use.

SPECIFICATION

128K RAM, ADFS Filing system, BBC Basic version 4, MASTER style keyboard, a single 640K 3.5" double sided drive. RGB/Mono Monitor as an optional extra.

Bundled software pack includes:

Desk Top Prog with note pad & calculator, VIEW 3.0, Card Index, LOGO & LOGOTRON. A set of exciting games and graphic demos.

STAR NL10

A 80 col 120 cps printer with fine NLQ at 30 cps offers novel and innovative features. There are no dip switches to set, full control from the front console. Plug in interface cartridge simplifies adaptation to different computers. Friction & Tractor feed as standards. Epson Compatible Graphics.

NATIONAL PANASONIC KX P1080

A high performance low cost printer with full character pitch feature 10, 12, 15 & 17 cpi and proportional spacing in both draft and NLQ mode. 80 column, 100 cps draft and 20 cps in NLQ. Parallel interface and Friction and Tractor feeds as standard. Epson Compatible Graphics.

EPSON LQ800

Uses top quality 24 pin dot-matrix technology.

* Superb 'letter quality' at 67cps.
* Fast clear draft quality at 200cps.
* LQ/Draft modes selectable from front panel.
* Variety of fonts, usable in both draft & LQ modes.
* Optional 'personality' modules for Diablo and IBM emulation.
* Optional Font modules.
* Friction feed.
* Hi Res bit image graphics with hex density.

ACW443 CAMBRIDGE WORKSTATION

*A complete self-contained workstation.
*'Bundled' software as 32016 co-processor.
*8Mhz NS32016.
*20Mbyte Winchester + 1 400K Floppy Drive.
*4Mbyte RAM as standard.
*Hi-Res Monitor *Detachable keyboard.
***Phone for detailed leaflet.**

PHONE FOR DETAILS OF RANGE OF 32BIT SOFTWARE NOW AVAILABLE

32016 CO-PROCESSOR

A second processor that brings genuine 'Mainframe' power to your BBC.

* 6 Mhz. NS32016 CPU
* NS32081 Floating Point Processor.
* Bundled' languages including: Fortran-77, Pascal, C, Cambridge Lisp, 32016 Assembler, 32Bit BBC Basic.
* 1Mbyte RAM fitted as standard.
* **Phone for detailed leaflet.**

512 CO-PROCESSOR

Brings professional software to the BBC Master.

* 10 Mhz 80186 *DOS PLUS.
* GEM Write & GEM Draw.
* 'WIMP' Environment with high quality Mouse.
* Runs many 'IBM' programs — even 'Flight Simulator'!
* Convert to/from IBM/BBC data.

DOTPRINT PLUS

A uniquely versatile NLQ ROM for the BBC Micro.

* Built-in character font generator.
* Built-in view printer driver.
* Supports microspacing for professional justification in View & with disc in Wordwise/Plus.
* True bold print as well as double width.
* 12 character pitch as standard.
* Fully variable pitch and line spacing.
* Suitable for fully **'EPSON'** compatible printers with quad-density graphics.
* **DOTPRINT PLUS** for EPSON FX/RX and compatibles.
* **DOTPRINT DUAL** for EPSON MX range.

MICROJUSTIFIED TEXT

homes of a ruling class whose right to rule was based on the ownership of land. Large estates produced money; perhaps even more important, they supplied people to fight for their

NORMALLY JUSTIFIED TEXT

homes of a ruling class whose right to rule was based on the ownership of land. Large estates produced money; perhaps even more important, they supplied people to fight for their

Notice how MICROJUSTIFICATION eliminates 'stretched' spaces between words.

EPSON HI-80

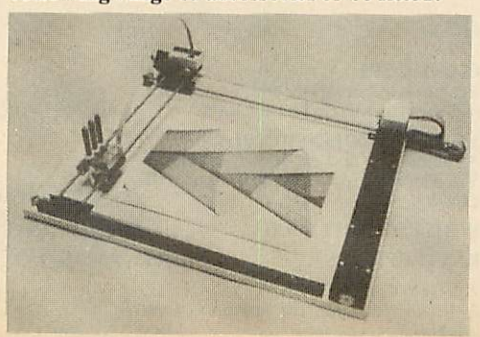
* Low cost while maintaining precision.
* A4 with 4 colour precision plotting.
* Variety of pens available.
* Ideal for overhead transparencies.
* Powerful software commands allow complex plots.
* Superb line/bar/pie charts simply produced.

HITACHI 672 PLOTTER

* A3 four colour precision plotter.
* Serial and parallel ports as standard.
* Produces 'OHP' transparencies as well as plain paper.
* 'HP' graphics language or single character commands.

GRAPHICS WORKSTATION

A A3 pen plotter with 0.1mm resolution allows graphs, charts, architectural drawings to be plotted using the 9 predefined plotting instructions or by using a CAD package. The pen mount allows a variety of pen types including drawing pens to be used or the following range of accessories to be fitted.



OPTICAL SENSOR

This converts the plotter into a input device and offers a new range of applications: Scan or digitise a picture or a drawing to display or store. Traverse mazes and investigate methods of artificial intelligence. Reliably read bar codes.

DRILL/ROUTER

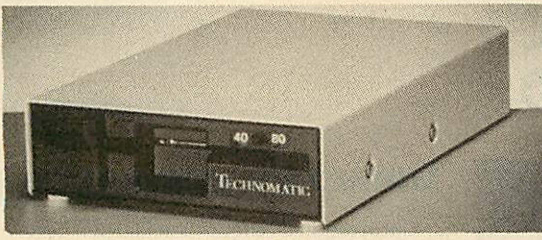
This will drill holes, machine moulds and cut complex 3-D shapes in a range of suitable materials to a depth of 16mm. Driver software is supplied on disc and an optional application program is available to interface the drill/router to our NOVACAD package.

SCRIBER

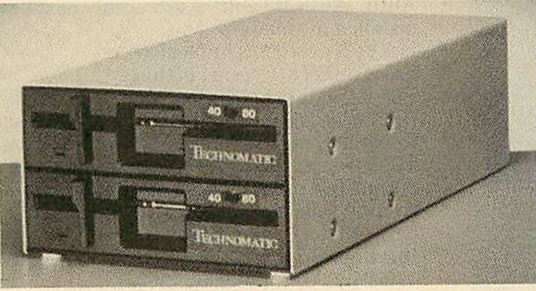
The sharp pointed scriber may be used to etch fine line drawings on surfaces such as scraperboard, wax coated copper etc. Full details on request. See page 1 for price.

All accessories available separately if required.

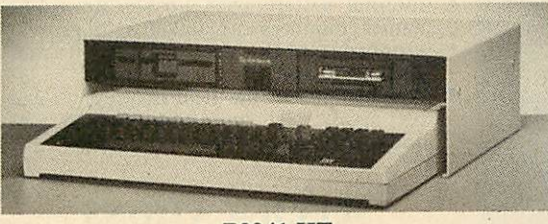


TS 400



PD 800


P2041 HT


PD 800 P

DISC DRIVES

TECHNOMATIC offers a wide range of high quality, high performance drives to meet all needs of BBC micro users. Please see our detailed and competitive price list on page 2.

*All drives are fitted with high quality slim line ultra low power mechanisms capable of single and double density operation and offering very fast track access and head settling times.

*5.25" floppy drives are fitted with 40/80 track switches as standard at no extra cost. The switches are located in the front and clearly marked to indicate the status at a glance.

*The mechanisms are set inside attractively styled, sturdy metal casings painted in BBC beige colour.

*The plinth version drives provide for a neat and compact system installation giving it a more professional look.

*All drives fitted with all necessary leads and are ready for operation on unpacking. The drives with the mains power supply are supplied with a mains lead fitted with suitably fused 13A moulded plug.

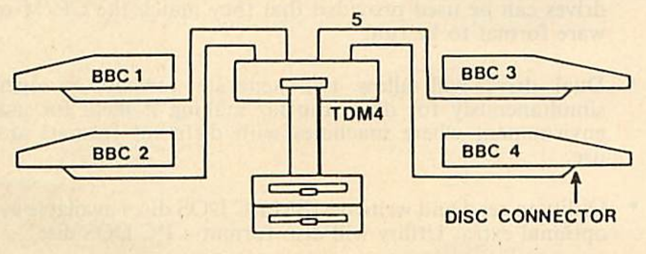
*Mass storage 20 Mbyte drives are available in the following versions:
- * P20HD Stand alone.
- * P204HP With a single floppy housed in a plinth version case.
- * P214TS Top of the range with a 10 Mbyte back up streamer and a single floppy housed in a plinth type casing and supplied with backup utilities.

All models are fully compatible with Acorn's ADFS system and include a mains psu and the necessary cable connections.

ALL TECHNOMATIC DRIVES CARRY A TWO YEAR WARRANTY AS STANDARD
(Effective 01.08.86)

DISC DRIVE MULTIPLEXER

The cost-effective alternative to networking! A self-contained unit that enables up to four computers to be connected to one single or dual disc drive. No hardware modifications — simply plugs into the computers disc interface connectors. No ROMs or other software needed. All DFS commands work as normal. The switching of drives between computers is totally automatic and completely invisible to the user. This unit is ideal for installing in classrooms and other situations, where networking is not planned or necessary, or where costs must be kept low. In many cases software needs to be shared, although full networking complexity and cost is not needed. Several of these units can be connected in series to allow more computers to access the same discs, i.e. two quads connected together will allow 7 computers to share 1 drive. Units are supplied with 5' of cable per outlet as standard. Mains powered.



TDM4 Quad Unit (up to 4 computers)
TDM2 Dual Unit (2 computers)

FLOPPICLENE

Disc Drive Cleaning Kit

Floppiclene introduces a positive concept in ensuring continuous high performance of the disc drives by providing an easy and efficient method of keeping the drive heads clean. Use of disposable cleaning discs eliminates the risk always present in reuseable discs of recontamination and abrasion of the sensitive drive heads. Available for both 5.25" and 3.5" drives. Please see page 2 for prices.

3M FLOPPY DISCS



3M are the worlds largest producer of magnetic media and are acknowledged as leaders in magnetic media technology. Every single 3M Floppy Disc carries a written lifetime guarantee that it will perform reliably. Not only do 3M offer a highest quality product but also a very competitive price. Please see page 2 for details. 3M Floppy Discs are supplied in sturdy storage boxes each containing 10 discs.

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MODEMS

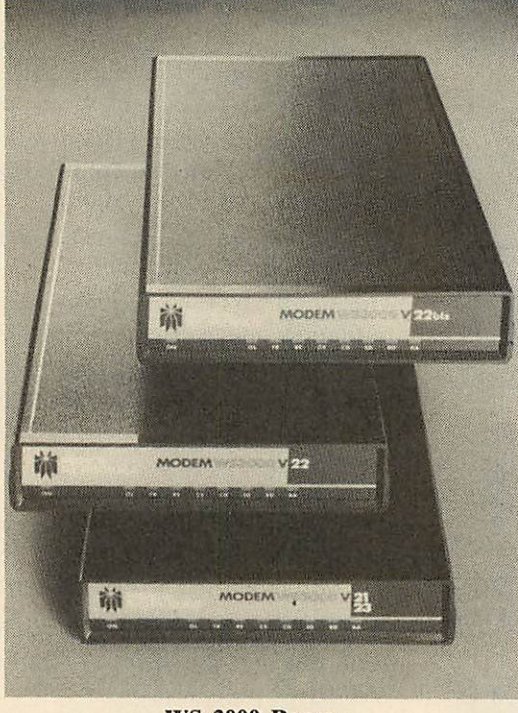
MIRACLE WS4000

* A cost effective intelligent modem that offers the best value for money bringing the world of data communication within easy reach.
* Plain English commands make it simple to use, even for the first time user.
* Latest Hayes-type protocol commands, auto dial, auto answer, auto speed seeking.
* Equalisation model in V23 for line-noise filtering.
* Many other options including upgrading to V22 and V22 bis.

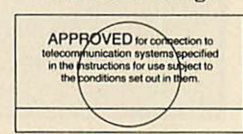
MIRACLE WS2000

* A comprehensive manually switched 'World Standard' modem.
* Competitively price with a capability to be upgraded for various options.
* BT approved for V21/V23, 300/300, 1200/75 and 1200/1200 half duplex.
* Includes BEL103/113/108 standards for use outside UK.

Optional extras include (Not BT approved).
* SK1 chip set for computer control.
* User port cable.
* Auto dial Board.
* Auto Answer Board.
* DS1 disc for auto dial facilities on Commstar.



WS 3000 Range



Please see page 2 for prices

MIRACLE WS3000 RANGE

* A professional range of intelligent modems with full BABT approval.
* Auto Answer and Auto Dial facilities installed as standard.
* HAYES protocols implemented.
* Pulse or DTMF 'tone' dialing.
* Plain English command structure simplifies the use of the modem.
* Integral parallel printer port fitted as standard configurable for both input and output for process control applications.
* A line sharing facility to differential between data and voice calls.
* Intelligent speed buffering converts 1200/1200 terminals to 1200/75
* Equalisation mode for line noise filtering.
* Internal battery back up for storing 63 names, numbers and default settings.
* Upgrade path for 1200/1200 and 2400/2400 and security encryption.
* Applications in the field of graphics and text access, high speed telex, user to user, and user to main frame.

SPECIFICATIONS

WS4000 V2123:	*CCITT V21/V23. *300/300, 600 and 1200 half duplex, 1200/75.
WS3000 V2123:	*CCITT V21/V23/Bell 103. 300/300, 600 and 1200/75
WS3000 V22:	*As V2123 and also 1200/1200 full duplex.
WS3000 V22 bis:	*As V22 and also 2400/2400.

MULTIFORM Z80





A unique Z80 2nd Processor with a 'MULTI FORMAT' capability.

* It is capable of running most CP/M 2.2 format applications programs on the BBC.
* Connects to the BBC via 1MHz bus, no restriction on the cable length. OS/M operating system on rom.
* Integral mains psu and 64K on board ram.
* 28 different formats including Acorn Z80, RML 380Z & 480Z, EPSON QX, Amstrad, Osborne etc, supplied on the library disc with the utility to create additional formats.
* Emulates the two of the most commonly used CP/M terminals, HAZELTINE 1500 and ADM-3a in addition to the Acorn VDU making installation of most of the software packages easy.
* Utility to inter convert ASCII text wordprocessed on a standard BBC and under OS/M or CP/M .
* Multiform is fully compatible with Acorn's 8271 and 1770 DFS on models B, B plus and the Master.
* Single density dfs allows single density CP/M format use. Double density dfs allows both single and double density CP/M formats to be used.
* Single or dual, single sided or double sided and 40 or 80 track drives can be used provided that they match the CP/M software format to be run.
* Dual drive will allow two separate formats to operate simultaneously for data transfer making it ideal for use in environment where machines with different formats are in use.
* Utility to read and write on IBM PC DOS discs available as an optional extra. Utility will also format a PC DOS disc.
* Multiform Z80 is supplied with a OS/M operating system rom, System disc and a Library disc. Please specify the DFS type and the drive format when ordering.

Please see page 1 for prices

BBC Computer
& Econet
Referral Centre

MAIL ORDER
17 Burnley Road
London NW10 1ED
Telex: 922800

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15 Burnley Road, London NW10 1ED
Tel: 01-208 1177 Telex: 922800
(close to Dollis Hill ⊖)

West End Branch
305 Edgware Road, London W2
Tel: 01-723 0233
(near Edgware Road ⊖)

For fast delivery telephone
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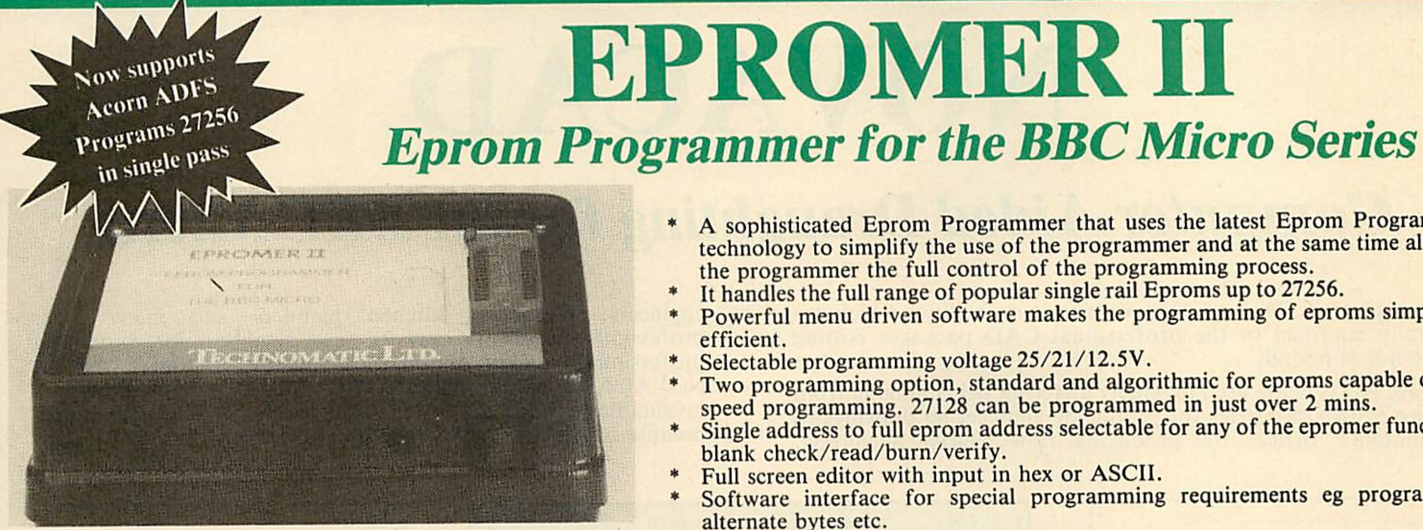
Orders welcome from
government depts &
educational establishments.

All prices ex VAT.
Prices are subject
to change without notice.

Please add carriage
(a) £8.50 (Datapost)
(b) £2.50
(c) £1.50
(d) £1.00

EPROMER II

Eprom Programmer for the BBC Micro Series



Epromer is supplied with a integral mains psu, all the necessary cables, a manual and software on disc. Disc also contains the rom image for use with sideways ram. Rom based software is available as an optional extra if required.
Epromer is fully compatible with Acorn DFS on the BBC B, B+ and the MASTER. Please see page 2 for price.

* A sophisticated Eprom Programmer that uses the latest Eprom Programming technology to simplify the use of the programmer and at the same time allowing the programmer the full control of the programming process.
* It handles the full range of popular single rail Eproms up to 27256.
* Powerful menu driven software makes the programming of eproms simple and efficient.
* Selectable programming voltage 25/21/12.5V.
* Two programming option, standard and algorithmic for eproms capable of high speed programming. 27128 can be programmed in just over 2 mins.
* Single address to full eprom address selectable for any of the epromer function ie blank check/read/burn/verify.
* Full screen editor with input in hex or ASCII.
* Software interface for special programming requirements eg programming alternate bytes etc.
* Many other useful utilities included.

Please send for full specification sheet.

META VERSION THREE

The only package available in the micro market that will assemble 27 different processors at the price offered. (Please see page 2).



* **Assembly for even more processors**
* **Now over 70k long on 2 16K Roms and 2 Discs**
* **Dozens of new options, features and directives**

The Original META system sold hundreds worldwide; it's being used in Universities, Polytechnics, British Telecom, the BBC, the MOD etc etc.
Now there's an even better version. It is supplied on two 16K roms and two discs and it is fully compatible with all BBC models including Master and gives you complete Editing and Assembly facilities for all the listed processors:

1802	6800	8085	6305
HD 64180	6802	Z8	6801
Z80	68HC11	68120	6803
6502 (including *all*	68000	68121	6805
CMOS varients)	8048 Series	6808	6804
65C812	8051 Series	6301	6809
65C816	8080	6303	

META uses the appropriate standard mnemonics for each, eg. LD (HL), 0ABH in Z80 and MOVE. B DO, $50 (A5, D6.L) in 68000 etc.
Full nestable Macro facilities are provided, and nestable conditional Assembly, (IF/ELSE/ENDIF), Modular source code (including parameter passing). True local and global labels, 32 bit labels and arithmatic (incl. MUL, DIV, AND, OR, XOR, SHL etc). 30 ways to send object code during Assembly, including Intel Hex, S.Record, Binary etc to Disc files, RS423, EPROM emulators etc, local reassembly and over 50 directives, including DS.X, DC.X, EQUX, FCB etc).
Wordwise-style Editor integrated in with Assembler; Search/Search-Replace, Block copy/delete, markers etc; dozens of special features and functions for Assembly code programmer. Fast and Friendly to use.
Plus special new serial Communicator Area with Complex Option page etc.

Send for your detailed spec sheet on the META Assembler and the PORTAL EPROM Emulators. Set of disassemblers and Logic Analyser coming soon.

Please specify the computer type when ordering.

PORTAL EMULATOR

* Provides real time emulation of all listed eproms at 150 ns.
* Totally software driven by (META).
* Compatible with 'piggyback' processors.
* Upto 4 portals can be used on the same BBC lead.
* Each PORTAL has a lead terminated with a 28 pin header to plug into the socket you need to emulate.
* Various options available for sending code: eg use two PORTALS for 16 bit data bus with sequential PORTAL skipping.

PORTAL is available in two versions:
PORTAL 128 for 2716, 2732, 2764, 27128.
PORTAL 512 for all of the ones listed above + 27256 and 27512.

BOOKS

No VAT
Carriage
Code
(c)

LANGUAGES
6502 Assy Lang Prog....**£19.95**
6502 Programming....**£13.95**
8086 Book....**£23.95**
Acorn BCPL User Guide....**£15.00**
Acorn FORTH....**£7.50**
Acorn LISP....**£7.50**
S-PASCAL....**£7.50**
Acorn ISO Pascal Ref Manual.**£10.00**
Intro to COMAL....**£10.00**
Intro to LOGO....**£7.50**
Micro Prolog Ref Manual....**£10.00**
Introduction to Turbo Pascal..**£14.95**
Prog the Micro with Pascal....**£8.50**
The UNIX Book....**£7.50**
Unix User Guide....**£19.95**
Understanding Unix....**£18.45**

BBC MICRO GUIDE BOOKS
BBC User Guide Acorn....**£15.00**
BBC Plus User Guide....**£15.00**
Drawing your Own BBC Programs....**£6.95**
Inside Information....**£8.95**
Math Prog in BBC Basic....**£7.95**
Toolbox 2....**£10.95**
Turtle Graphics....**£7.50**
VIA 6522 Book....**£4.50**

PROGRAMMING/UTILITY
Advanced User Guide....**£12.50**
Applied Ass./Lang on the BBC.**£9.95**
BBC Micro Sideways ROM's RAM's....**£9.95**
BBC Micro Sideways Roms B. Smith....**£9.95**
Guide to the BBC ROM....**£9.95**
Beginners Guide to W.P....**£7.95**

View 3.0 User Guide....**£10.00**
Viewstore....**£10.00**
Viewsheet....**£10.00**
Wordwise Plus....**£9.95**

SOUND & GRAPHICS:
Advanced Graphics with BBC...**£6.00**
Creative Sound on the BBC....**£9.95**
Mastering Music....**£6.95**

DISC DRIVE SYSTEMS:
Advanced Disc User Guide....**£14.95**
BBC Micro Disc Companion....**£7.95**
Disc Book....**£3.50**
Disc Programming Techniques..**£7.95**
Disc Systems....**£6.95**
File Handling on the BBC....**£6.95**

APPLICATIONS:
Interfacing Proj for BBC....**£6.95**
BBC and Small Business....**£5.75**

PROFESSIONAL SOFTWARE
Wordstar made easy....**£16.95**
Introduction to Wordstar....**£17.95**
Wordstar Handbook....**£11.95**
dBase-II for the first time user.**£16.95**
Understanding dBase-III....**£22.95**
Multiplan Made Easy....**£18.95**
Multimate Complete Guide....**£16.95**
ABC of LOTUS 123....**£17.45**
1-2-3 for Business....**£16.95**
Adv Tech in dBase II/III....**£22.95**
Mastering CP/M....**£17.95**
CP/M Bible....**£16.50**
Introducing CP/M on BBC & Z80....**£9.95**
MS/PC DOS Prompt....**£10.95**

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(close to Dollis Hill ⊖)

West End Branch
305 Edgware Road, London W2
Tel: 01-723 0233
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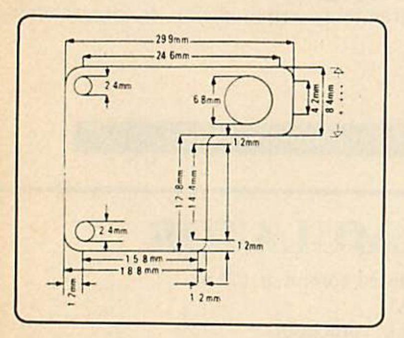
Please add carriage
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(d) £1.00

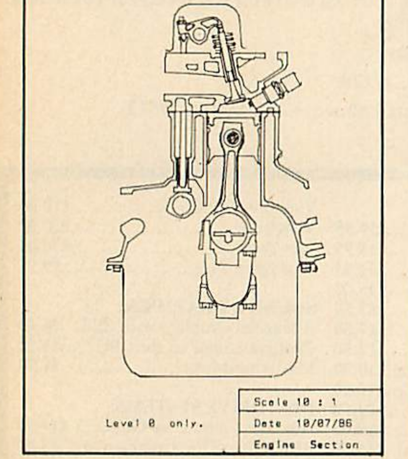
NOVACAD

Computer Aided Draughting for the BBC Micro

A sophisticated CAD package with unique facilities which are generally confined to the professional CAD packages costing thousands of pounds.

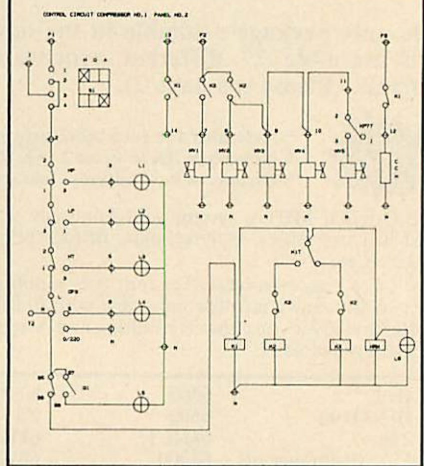
NOVACAD is being used in widely differing fields ranging from leading British industries for producing engineering drawings to Accountants' offices for producing flow charts. Architects, engineers, plumbers, kitchen planners and many other professions requiring easy to use facilities for producing professional quality output are making extensive use of NOVACAD's unique features. NOVACAD is proving to be a invaluable teaching aid in technical schools and colleges simply because of the ease with which it can be used.

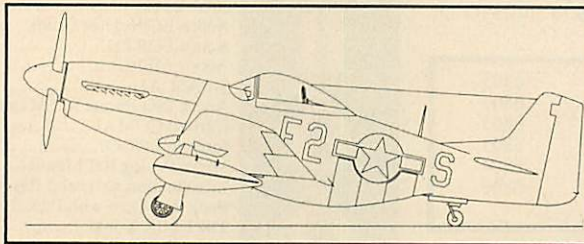




The major features of NOVACAD are:

* Simple and easy to use with logical command sequence.
* A large drawing area (approx 15 screens).
* The ability to create complex icons (upto 500 lines instead of the usual 15 to 20 pixels), store them in a library and recall them at different scales and orientations.
* A zoom facility allowing magnification of up to 20 times to insert finer details.
* Block copy of shapes on the screen for repetitive use.
* Text entry at any 90° orientation at any position on the screen.
* Create multi layer drawing with 8 levels available.
* Full compatibility with the BBC range with minimal hardware requirements yet having the capability of exploiting the potential of the extra shadow memory or the second processor's memory and speed.
* Printer routine for Epson 80 and 136 column printers.
* A unique facility to output to any BBC compatible plotter.





MINIMUM HARDWARE REQUIREMENTS

- **Any BBC range computer with Acorn DFS.**
- **40 Track single sided single drive.**
- **Epson compatible dot matrix printer.**

With basic BBC B, NOVACAD operates in mode 4 allowing use of any 2 colours with shadow memory, it can also operate in mode 0 for higher resolution or mode 1 for allowing use of any 4 colours, and it will have additional user memory for more complex drawings.
6502 second processor will also increase the drawing speed.

NOVACAD is available in two versions

*BASIC version for cursor control from the keyboard.

*T/M version for cursor control from the keyboard, Tracker Ball or a Mouse.

OPTIONAL EXTRAS

Plotter driver generator is available as an optional extra to configure a plotter routine for any BBC compatible plotter. Pre-configured programs for the popular plotters like **Epson HI 80, Hitachi 672, Plotmate, Penman** and **HP GL.** This program allows the drawing to be scaled to the maximum plotter size thus enabling drawing of A2 and A3 sizes to be produced with equal ease. The zoom facility will enable inaccuracies of drawing on the screen to be eliminated.

ROUTCAD, an optional software package for our Graphics Workstation allows for production of shapes drawn using NOVACAD in 3D on suitable material and is ideal for a range of applications including template making and model building.

NOVACAD package includes a 16K ROM, Utility disc and a comprehensive manual.

LETTERS

Write to Letters, Acorn User, 141-143 Drury Lane, London WC2B 5TF

PROBLEMS AND PROGRAMS

Sir, The academic year just beginning sees the start of the first GCSE courses, replacing GCE 'O' and 'A' levels, for students in our secondary schools. The two year courses will be watched eagerly by parents, teachers and industrialists alike to see how their results match the promise of their syllabi.

Many of the courses have set new heights for learning in secondary schools. Problem solving, rather than rote regurgitation, will become the new norm. One subject, however, seems to have made a major change of direction. This is the Computer Studies GCSE, where some syllabi recommend the de-emphasis of programming as an accredited course activity.

Reasons quoted for this include: that computing should be applications based, rather than centred around the non-realistic gas bill programs which children were assumed to churn out en-route to the 'O' level. Others would have us believe that programming is an activity for a select few, or there again for no-one, because computers will eventually program themselves. Hence we should concentrate on the more important aspects of problem solving.

However, talk of problem solving brings us to a new concept in mathematical education. Teachers are encouraging children to use the computer to design, test and explore problem solutions using Basic library routines or Logo procedures. Not so long ago, we called that programming. Also some secondary English departments are beginning to use similar techniques in language work.

What is more exciting still is that primary schools, having been warned to discard programming four years ago, are now becoming embroiled in programming activities in almost every forward-looking classroom. Programming in maths, language, design, science and project work is seen as part of the key to unleashing children's thinking skills and assisting with social skills, by encouraging teamwork.

How sad then, to see many founders of secondary school computing turning their backs on programming as an activity, when other curriculum areas accept that it still has a great role to play. One faint light on the horizon is the many and varied information technology (IT) courses, which are hoping to gain credence with teachers through the TVEI schemes. Some of the more modular versions of these courses accept the role of programming as a necessary part of problem solving, and recognise the enjoyment with which many of our children tackle programming.

Such syllabi contain modules which cover programming in new exciting ways, but although these courses are acceptable up to 1988, their continuity is in the hands of the Secondary Examinations Council, and this august body might equate IT to computer studies. In such a case, we can only guess the end result. Perhaps programming activities in the subject area called computing will cease, or continue subversively, or perhaps we will see programming taking up a place as a problem solving tool within many subject areas.

Whatever the outcome, programming remains one of the few activities which links concrete experience to abstract thought. It gives each of us the power to build, test and refine our hypotheses and allows us to realise the power of language, demonstrating for example that a thought, expressed in written words can control devices within the world outside the computer.

Joe Telford
Cleveland

CARTRIDGE CRITICISM

Sir, After two years with a trusty model B, I decided to upgrade to a Master 128. I am generally very happy with it.

What I am not so happy with are my first ROM cartridges, one of which, despite working in the electronics trade, I damaged on my first attempt to insert a ROM. The basic design seems flimsy and over priced. Surely it would have made more sense to have two fully enclosed halves held together with screws fitted with two normal ROM sockets. It would be simple to remove ROMs, by normal prising from each end, with the case halves separated.

I enjoy reading your magazine each month but is it possible during software reviews to say if the programs are Master compatible?

David Hallsworth
BFPO 41

Acorn's reply to criticism of these cartridges is that people don't use them properly. The answer to that, surely, is that it shouldn't be possible to use them improperly. No doubt third party companies will mop up.

On the Master front, there is little Master-compatible software around – although the appearance of the Compact looks set to change that.

ACORN'S HEAD IN THE CLOUDS

Sir, I am writing in reply to Reg Smith's letter (August) commenting on a letter of mine. I would like to clear up the point I was making, concerning the model B. A few months ago before the Master's launch, the BBC B was selling for still a ludicrously high price. The technology was there to add shadow memory, but Acorn chose not to introduce it. Amstrad showed us what real value for money was. There is no excuse why Acorn couldn't have bundled in a monitor and small drive (as retailers are doing with the Electron).

Obviously when the model B was launched it was way ahead of its time. But Acorn chose to keep its head in the clouds until it was too late.

A good structured approach to programming is important, but to rely on loading and reloading chunks of program to achieve this can only lead to lengthy development times and unwieldy maintenance of a program. When technology existed to make even a modest full 32k available, Acorn refused to listen.

I S Gibson
Maidstone, Kent

Acorn has now launched the Master Compact bundled with disc drive and monitor. Obviously comments such as these have not fallen on totally deaf ears.

ARMCHAIR USER

Sir, I first started taking *Acorn User* early in 1985 when I had access to a BBC micro and began Basic programming. This was my first experience of computers. However, that has long since passed, but I still read your magazine and would like to express my thanks for an enjoyable and educational read, even for me as an 'Armchair User'.

I'm also glad to see the start of Tessie Revivis' articles on machine code, now I will be able to understand all the yellow pages!

P Stanley
Bacup, Lancs

BALANCING ACT

Sir, Further to your review of our Teletext Control System (June, page 147), I would like to offer some experienced comments to balance those of your reviewer who has not had sufficient time to explore this very powerful package. The two programs: *Tex* – the teletext editor, and *Pam* – the picture animation manager considerably simplify the task of producing animated newsreels and adverts.

The original documentation was skilfully reduced to quick-reference proportions when it became evident that, with all the screen-prompts, eight A4 pages would be ample. The menu at the bottom of the screen maps onto the red keys directly; it is much easier to use than a card strip. There are so many options to be kept in view at the same time as the source and destination pages that some abbreviation is necessary. The operations soon become fluent and abbreviations are then preferable.

Scrolling before saving prevents accidental overwrite; your reviewer might have called this a minor inconvenience or a compromise but he chose an exaggerated term which does not inform the reader. Furthermore, sequences can be any length up to 50 pictures and the review is seriously misleading on this matter.

I would like to point out that our programs are complex and powerful tools which defy simplistic treatment. They were designed to provide long-term interest with so much depth that we consider it valuable for a teacher to spend some time exploring all the options before allowing general use. We advise our educational customers accordingly.

A H Evans
Promotional ArtWork
Systems, Leeds

LOADING THE UNLOADABLE

Sir, While flicking through your excellent publication, I noticed an article entitled Programs Retrieved by Simon Kindlen in the August '86 issue. I would like to proffer a simpler method of loading the unloadable. Before loading the program, enter:

*OPT2,0

This, as indicated in the User Guide, will cause the computer to ignore errors when loading (although an error message is given), thus the file is read complete.

If, as is often the case, only two or three bytes are corrupt, they can be easily changed without re-typing whole blocks of code.

Paul Tarttelin
Berks

COMMUNICATION PROBLEM

Sir, Let's have more letter-writing, and thank-you to *Acorn User* for keeping us Acorn users in touch with each other. In my experience Acorn Computers certainly does not do a very good job in either of those departments. Don't worry J N Wilmott of North Humberside, (Letters, August issue), your reply will arrive, but only if you are prepared to back it up with pounds spent on phone calls and a patient wait. Then of course you have to accept the absolute minimum of information and not complain about it (Acorn is a very busy company you know – you can tell that by the amount of time it puts your phone call on hold).

To other Master-users out there, may I pass on a few things that I have learnt.

The *Master Welcome Guide* is only 'to enable the new user to make a start' and then it 'is reasonably common practice in the industry to make additional guides available for a small charge'. (Quotes from Acorn).

Certain incompatibilities between the old and the new DFS might be overcome by booting with Shift-Z-Break.

More serious incompatibilities arise if your disc drive doesn't even work! Anyone who has 40 track DFS problems, don't worry too much. Have a peep under your keyboard and check out the 1772 controller chip. (Yes it still tells you on the screen it's a 1770, but it's not). This is not widely publicised, if at all, and can lead to problems, but can be solved by a new 2.28 DFS available as an upgrade from Acorn. The new DFS will allow you to change step times down to 12ms. It will be standard on the 1772 chips in the future says Acorn. All this should be known to Acorn dealers, but was news to my local supplier.

Welcome discs seem to be notoriously bad. I'm about to return my third. Keep sending them back, I say! I have had no success at all with either Dircopy or Copyfiles.

I still maintain that the Master must be a good machine, but then I grew up with the BBC B and I'm definitely biased.

However, my beliefs have taken a bit of a battering over the last four months since I took delivery of my first Master. (I'm now on my third machine and things are being sorted out, I hope. Remember though that things do not sort themselves out on their own!).

Andrew Megginson
Loughborough

FROM BASIC TO VIEWSHEET

Sir, I have just purchased a BBC Master. I wish to be able to input data into *ViewSheet* directly from Basic. The following example procedure call illustrates the requirement:

PROCin_sheet$(text$, x%,y%)

where text$ is the text to be inserted, and x% and y% give the rows and column in which to insert the text.

Also I need something like:

PROCin_sheet%(value%,x%,y%)

where value% is the integer value to be inserted. Insertion of floating point numbers would also be useful.

Can readers help?

Brian Bowman
Bowman & Co
(Software) Ltd, Bucks

NO WAY TO SAVE MEMORY

Sir, I have read the letter in the July issue of *Acorn User* about the Electron not being as good as the BBC micro.

I need a routine to enable me to alter the ROM as on other machines. I thought to myself, if the Electron has the same Central Processing Unit and the same amount of ROM, then why can't I save the ROM of a Beeb and then poke it into the Electron's ROM?

Edward Avis
Exeter

Most ROMs should work on the Electron providing that they do not rely on the BBC micro hardware (in other words the teletext chip, the screen display chip or any of the interfaces).

Companies like ACP and Slogger are good sources of Elk firmware.

ROMs being what they are (Read Only Memory) it is not possible to perform pokes to change ROMs and make them compatible.

NEW SOUND FOR ELECTRON

Sir, I have recently purchased an Electron and I am quite pleased with it.

I have a Master RAM board fitted to my Electron and a Plus 1 unit.

I do not like the sounds my Electron produces, so would it be possible to add the BBC micro's sound chip to improve it? I would also like to know if the mode 7 chip (SAA5050) would be able to fit into the spare ROM socket inside my Electron.

I know that the 6522 interface chip can be fitted to the Electron, can this be used to link two Electrons together? Would the addition of a 6845CRT controller improve software compatibility between the Beeb and Electron? With my Master RAM board I have a 64k Electron running at BBC speed.

Would this enable me to run some Beeb games where memory is lacking?

P Key
Bridgend

It should be possible to add extra sound generating circuitry to the Electron, however I have no details on how to do this (does anybody have any ideas?).

A teletext chip could not be added inside your Electron case as you suggest – however a teletext adaptor was sold for the Electron a couple of years ago by Sir Computers.

Unfortunately it has now ceased trading, but you might be able to pick one up second hand via the free ads section at the back of the magazine (has anybody got one to sell?).

Electron owners watch out for a series on interfacing your Electron, coming soon in *AU*!

EXPANDING THE ELK

Sir, I am writing for some much needed expert advice and information.

At present, I am the owner of an Acorn Electron micro, with the only peripherals being a cheap tapedrive and a Hitachi television RGB monitor. The time has now come for system expansion to include a wordprocessor, mainly to be used for standard letter writing and CVs, for which I presume I would require a program on disc with its associated disc drive.



Electron: a basic micro capable of sophisticated expansion

Being a newcomer to micros, I need some advice on exactly what hardware and software I would require and what type and make you would personally recommend plus some idea of the actual costings involved.

P Hawks
Portsmouth

I suggest you set yourself up with the *View* wordprocessor. This is supplied in cartridge form for the Electron so you will also need to obtain the Electron Plus 1 expansion unit. Your local Acorn dealer should stock these – prices vary but expect to pay up to £100. The recommended disc interface is the Advanced Plus 4 from ACP (reviewed in the July issue) cost £80.44.

There is a whole variety of disc drives – again the July *AU* provides full details, but you must anticipate spending anywhere between £80 – £250 depending on your requirements.

RAMMING IT IN

Sir, Recently I bought a Viglen cartridge system and wish to know whether it is possible to have sideways RAM by using a RAM chip in one of the cartridges. If so, what type of RAM chip would I need and where could I obtain it?

Michael McCartney
Dorset

Yes it is possible, but rather involved to use a cartridge. Basically you need to solder a wire onto pin 26 of a 6264 RAM chip and take this to any write line on the main BBC PCB – typically pin 10 of the 8271 (IC78). Pin 26 on the RAM chip should be bent out and not inserted into the cartridge. You will also need to write specialist software to enable your ROM-based programs to be transferred across into the RAM. This involves *LOADing the ROM image into RAM, selecting the ROM slot number by writing it into &F4 and &FE30, and then copying the image across to &8000 onwards byte by byte – obviously this needs to be a machine code program.

A forthcoming article in *AU* will show you how to install 8k of sideways RAM into a Beeb.

POKING ABOUT

Sir, I spent ages puzzling out how to dodge the arrows in *Wizadore* and therefore decided to find or make a poke which would get rid of them:

```
*LOAD WIZADORE
?&37AA=&00
CALL&4F6A
```

However, it does not get rid of the bird's arrows.

I've also devised a poke for the game *Commando* to give infinite lives:

```
*LOAD DGAME
?&23BB=0
CALL&6D00
```

G M Reid
Middlesex

WHAT TO DO WITH THE WAND

Sir, I have got the answer to Andy W's question on *Castle Quest*. Take the wand to the place just right of where the troll is and go down until you see two yellow men. Kill these men and go right, but don't fall off the place by the ladder into the moat. Just throw the wand right and you will have completed *Castle Quest*.

Michael Joe Woolley
Dorset

QUESTIONS ANSWERED

Sir, When you finish *Castle Quest*, it's a great shame that all you see are a coin, a gold bar and ruby in the wall with the message: 'Game over, Treasure found'.

In reply to Alex Atkin's plea for assistance to get past the troll, you get the gem from the green guards up from where you start. With this item you run to the troll's bridge and he will rush at you. Throw the gem at him. He will catch it and run back to his lair, leaving the path free for you to go through. At later stages of the game you can also use a gold bar or a coin.

If you want, you can recover the gem (or coin or gold) from him. You do this by waiting for him to come back up, then let him run along a little, ensuring that he follows you. Then duck down the other ladder – grabbing the gem – and run off. The troll follows, but soon gives up.

To get past the spider at the other side get the torches (one from near the green guards, the other from near the starting position) and place one along the route of the little red men, then round them into the top hut with the other torch. Follow them and make them go into the spider's lair by blocking their route back. Follow them in fairly closely, but not too closely as they may get behind you and run off. The spider comes down and eats one, you grab the sword and push them back through. It is important that you keep them close or even one on top of the other as that way, if they continue past the sword, the second spider will only eat two, whereas he could eat the remaining three if they were apart, leaving you stranded in the middle, having to die and start again. There is no point in going straight through as the witch will kill you and you can't take the red men with you as they just go back to the spiders' area, leaving you stranded. The red men come back enabling you to go through with your bucket of water to kill the witch and get the wand. However, the sword won't kill the troll, spiders or witch.

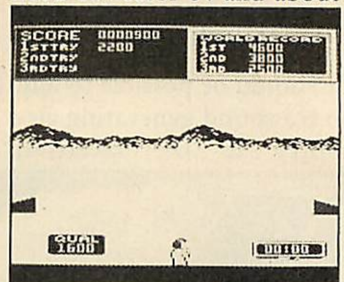
Michael Bickett
Glasgow

HYPER CHEAT

Sir, Want to know how to cheat at *Hypersports*? Do you want to know how to get rid of the vault and replace it with the shooting?

Well here's how!

Use a disc editor to find track 00 sector 04 and about



Hypersports: how to cheat

half way through the sector there is a set of loading commands. All you have to do to change the order is to change the numbers after the *L.CODE<number>. The numbers correspond to the events as follows:

1 Swimming
2 Shooting
3 Archery
4 Triple Jump
5 Weight Lifting
6 Vault

Iain Freeman
Glasgow

PRAISE THE ELECTRON

Sir, I feel I have to reply to J Harris of Preston's letter about the Electron.

Yes it has its faults such as a tacky PSU plug type, it's fragile to say the least, but what can you expect for £79... I once had a Dragon 32 and what a junk heap that was. Compared to the Electron it was a snail and not reliable.

The Electron has a good Basic and assembler, a nice keyboard, a so-so manual.

To sum up it's a very nice micro. I have two questions, is there an RTTY program for the Electron and also a toolkit ROM that will give partial renumber on the Elk?

Keep up the good work.

Peter Baillie
West Lothian

Beebugsoft produces its *Toolkit* ROM for the Electron (phone (0727) 60263).

I am not aware of any specific RTTY programs for the Electron, do any readers know the answer?

PRINTER RULES

Sir, Like K G Schofield (Letters, August) I decided to buy an Amstrad DMP2000 printer as there had been complimentary remarks about it in *Beebug* and, like him, I have been highly delighted. However, one problem arose when I wanted to replace the ribbon, the suppliers (Comet) did not carry ribbons in stock so I asked them to order some. After waiting three weeks, I was becoming desperate until I happened to be in the local branch of John Lewis where I was told that they always had ribbons in stock.

From this experience I have deduced two rules which I'd like to pass on to readers:

1. Don't buy equipment which uses consumable items like ribbons unless the dealer can assure you that they will always be able to supply them on demand.

2. Don't ignore the high street stores as they can sometimes be more reliable (and often cheaper).

Many thanks for your excellent magazine which always contains something of interest.

David Driver
Nottingham

MISSING LINKS

Sir, First of all, Mr Bonehill (June 86) asked about a book to make a simple robot's arm. I would advise he buys *How To Make Computer-Controlled Robots* published by Usborne. It is written for 11+ age and is simple to follow.

My query is that I want to learn how to write linked lists in BBC Basic. Please could you recommend some books. I would prefer ones that assume no previous knowledge of computing, as they are usually the best written texts, but would like to know of anything on linked lists.

Paul Turner
Co Durham

Who hasn't looked through his back issues of *AU* then! Stan Froco covered the subject in our August 1983 issue, pages 24 and 25 to be precise. Next...

FULL STREAM AHEAD

Sir, I have just bought *Southern Belle* and I have to say, it's brill. How, then, can a program of this quality enter the top 20 at number 7 in June and one month later fall out. I don't understand it. But if you've got Computer Concepts' *Disc Doctor* the game crashes.

To solve the problem, either take *Disc Doctor* out, or use the following program:

```
10 MODE4
20 ?(673+N)=0
30 END
```

The N represents the number of the hole you have placed the chip in, ie, if ROM number is 14 then

```
10 MODE 4
20 ?(687)=0
30 END
```

This will disable the ROM until you switch on the computer.

Paul Gent
Stockport

HOW TO HIT THE HEIGHTS

Sir, I have been examining your high scores chart (ha ha ha), I have one comment to make, RASSPP!

If you would care to observe, in your chart the high score for *Chukkie Egg* stands at thirty million! The game's score chart can only display scores up to 100,000.

Please tell me how it is possible to get this score, without going back to 000000 all the time.

I have never heard of anybody reaching eighty million at any game, let alone *Chukkie Egg*, or, come to think of it, twenty million, at *Frak*!

It is very frustrating for us lesser players, who know we have not a hope of reaching, never mind bettering, these so-called high scores.

Please demand proof that readers have actually achieved the score they boast.

Yet, I can on the disc version of *Elite* for the BBC B, reach the dangerous status, get all of the equipment, complete the first mission, attain 100,000 credits, and be in the second or third galaxy in less than one day. Without cheating.

Jason Dempsey
Surrey

The only way to achieve these highly enviable mega-scores is to go round and round the clock. Also you can expect it to take days to attain these heights!

Latest round-up of games high scores

Battletank	Superior	117,400	Stephen Gayler
Castle Quest	Superior	2,270	Jonathan J Hallet
Fortress	Pace	138,720	Stephen Gayler
Match Day	Ocean	14-0	Peter Harvey
Mr Ee	Micro Power	1,012,950	Stewart Roberts
Overdrive (BBC)	Superior	380,640	Stephen Gayler
Rocket Raid	Acornsoft	168,010	Stephen Gayler
Zalaga	Aardvark	29,329,420	Stephen Gayler

All time bests: *Aviator, P. Hopgood, 30,450; Android Attack, Tim Hedger, 1,495,105; Arcadians, Nidz Islam, 98,020; Chukkie Egg, Stephen Concoran, 30,275,420; Crazy Painter, Richard Arundale, 279,790; Cybertron, Niaz Islam, 715,960; Frak!, Paul O'Malley, 20,000,200; Free Fall, Philip Comber, 5,024; Hopper, John Durrans, 52,422; JCB Digger, Stephen Concoran, 131,450; Killer Gorilla, Stephen Concoran, 836,475; Meteors, P Ludgate, 498,500; Missile Control, Ian Boffin, 469,225; Monsters, Stephen Concoran, 283,000; Moonraider, Stephen Concoran, 642,125; Overdrive (Electron), P Ludgate, 1,011,720; Painter, Nigel Shaw, 203,690; Pengo, Stewart Roberts, 300,400; Planetoids, Stephen Concoran, 3,186,450; Pole Position, Niaz Islam, 384,250; Snapper (BBC), Peter Simpson, 1,839,210; Space Adventure, Mark Bradshaw, 4,890; Starship Command, Ian Boffin, 8,420; Way of the Exploding Fist, C Parsons, 397,100.*

Please say whether your score was notched up on a BBC micro or Electron when sending in your games high scores as in future we hope to be publishing separate tables for each micro.

NEW RULES FOR HIGH SCORES

Sir, Your magazine continues to print high-score tables, one of the few that does, and looking at the August issue on page 55, I can see why so many magazines do not. *Mr Ee*! is the only high score which has been beaten since May 1986. Not only that but the table is dominated by three people. These scores represent gaming skill, certainly more than I possess, but what is the point? These people are obviously good but they are credited every month and the scores are out of reach of most people.

The way arcade game designers by-passed the skilled few was to have an all-time hall of fame, to be looked on with wonder, and a daily high score so people like me had a chance. Although you can contend that the micro games market is different, it cannot be so different or you wouldn't print high scores. The inclusion of a monthly high score total would, I am sure, liven up this section of the magazine.

V J Roberts
Essex

Points taken, so here's a new set of rules for high scores in future issues.

First, the score must be witnessed by two people, at least one of whom is over 18, and preferably a parent.

Second, any score unbeaten in three months will go into an 'all-time best' listing at the bottom of the regular table.

Third, entries must say which machine the scores were on – BBC, Master or Electron – so we can do separate charts.

Let's see if that livens up the chart.

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'Excellent value for money' – Viewfax Tubelink

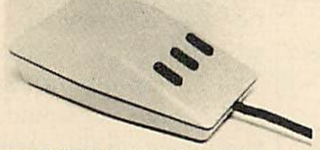
Please state 40T or 80T, single or double sided disc

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BBC ☆ MASTER ☆ ELECTRON ☆ MICE

✻ MEGAMOUSE



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✻ DIGIMOUSE

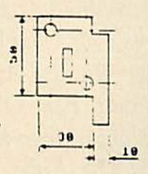
Digimouse Another accurate and quality input device – second only to Megamouse. 50 points to inch resolution. Rubber coated ball. Ideal for popular use with Wigmore, AMX and other mouse packages. Incorporate in your own software with unprotected machine code routines provided. **£34.90 incl.**

✻ ANAMOUSE

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✻ CADMOUSE SOFTWARE

Cadmouse Software Advanced drawing package operating in Mode 0 for super resolution of Mode 1 for real time colour. Reviewed as "best drawing package on BBC". Powerful "move", "duplicate" and "invert" features are inclued as well as numerous CAD features. Hundreds now in use. **Disc only £29.90.** Wigmore or AMX mice or RB2 Trackball.





✻ MOUSEPAINT

Mousepaint Powerful but friendly introductory graphics package for use with mouse or trackball. Versions available disc or cassette for BBC but cassette only for ELECTRON. Rubber lines, corrected lines, freehand, variable painting, circles, rectangles, ellipses, Mode 1 choice of 4 colours, EPSON print, save, load, fill, hatch fill, text, continous and dotted lines. **£10.00 incl.**

✻ ARTIST

Artist dramatic and sophisticated new BBC pure art package operating in Mode 2 for all 8 prime colours. Every pixel is addressable and one can design any multi-colour paint brush, air bursh or icon. Innovative features include "under and over" (paint above and below other colours) "colour cycling", "colour without" (copy a picture without the background) and animation. Tubelink review "unrivaled and boasts a power undreamed of". "A joy to use" etc. ROM+Disc. **£49.90. incl.** A&B: "Finest graphics aid ever seen".

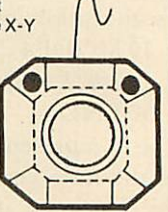


✻ EASICALL

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✻ ANALOGUE TRACKBALL

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HINTS & TIPS

Martin Phillips and Bruce Smith describe ROM arrangements, also indenting with Wordwise, disc drive and disc filing system problems plus printing teletext characters

FITTING ROMS MADE EASY

At one time the instructions for fitting ROMs were easy as there was only one computer. Now there are BBC, BBC B+ and Master micros, and fitting ROMs is different for each machine.

When you buy a program in ROM form, it usually comes as a chip stuck onto a piece of black foam. Often, the pins are splayed out, and so will not fit into the socket. Chips are produced like this for commercial manufacturers who fit them using machines, and then solder the whole circuit board by passing it over a wave of molten solder. The splayed pins spring against the side of the holes in the board and so stop the chip falling out before it is soldered. Useful for them, a nuisance for us!

The simple way to overcome the problem is to hold the chip on its side with one set of legs flat against that surface, and then rotate the chip so the pins are bent slightly in. Do this with both sides. It should then fit easily.

You may have heard that chips can be damaged by static voltages, and this thought terrifies many. Although the warnings are sound, the chances of damage are not high. Pins can safely be touched without undue harm. If you want to be really safe, when the cover is removed from the computer, plug the computer into the mains, ensuring that both the computer and wall switch are off and then use the metal top of the power supply to bend the pins over on. This metal case will be earthed, and so should have no high static voltages present.

Sometimes it is necessary to swap the ROMs round so they do not clash with each other. The ROMs are quite difficult to remove. The easy way is to use a thin screwdriver between the ROM and its socket and gently lever one end out. Do this at both ends to avoid bending the pins. Do not lever the ROM against the circuit board, as this can damage the circuit board, or lever the socket out with the chip.

The sockets are a tight fit, and some force is needed to insert a chip. Once the chip is located in the socket, check no pins are bent underneath or splayed outside the socket before pushing it fully home.

Now let's look at the different micros. In the instructions, it is assumed that you are viewing the computer with the keyboard nearest you.

Inserting ROMs into the BBC B

1. Ensure the computer is switched off and unplugged at the mains.

2. Remove the four screws holding the cover. Two are located underneath and two are found at the back of the machine. Usually these are labelled 'Fix'.

3. Unscrew the keyboard. Some machines have two screws, some three. Unplug the keyboard connector, and the connector for the speaker.

4. Identify the ROM socket area. This can be found at the bottom right-hand side of the main circuit board (see figure 1 on page 51).

5. Basic is sometimes plugged into socket D on this model (identified by a serial number ending in B01 or B05). If it is, move it to socket A. If a DFS or NFS are fitted, they will occupy another socket.

6. Your ROM can be inserted into any of the remaining sockets. It must have the small notch pointing towards the rear of the board.

7. Refit the keyboard, remembering to connect up the speaker and the main keyboard lead, and refit the cover.

8. Switch on the machine and check all is well. If not check that the keyboard connector is properly in place, or that no pins have been bent on the chip.

Inserting ROMs into the BBC B+

1. Ensure the computer is switched off and unplugged at the mains.

2. Remove the four screws holding the cover. Two are underneath and two are at the back of the machine.

3. Identify the ROM socket area. This can be found near the top left-hand side of the main circuit board (see figure 2 on page 53). Basic and the operating system occupy the socket next to socket A, and the DFS will usually be in socket A.

4. Your ROM can be inserted into any of the remaining sockets. It must have the small notch pointing towards the rear of the board. Do be careful not to use the two other sockets – these are for the speech processor! At the side of the ROM sockets are some circuit board links. These are numbered links 9,11,12,15 and 18. Set these links to the left for an 8 or 16k ROM, and to the right for a 32k ROM.

- link 18 is for socket A
- link 15 is for socket B
- link 12 is for socket C
- link 11 is for socket D
- link 9 is for socket E

5. Refit the cover.

6. Switch on the machine and check all is well. If not make sure that no pins have been bent on the chip.

Inserting ROMs into the Master

Note that it is intended that ROMs for the Master are used in cartridges put into cartridge slots, and not normally in the ROM sockets, though these can be used at the expense of sideways RAM. Apart from the disadvantage of the cost of the cartridge sockets, they have several advantages: an unlimited number of ROMs can be catered for (bye-bye sideways ROM boards and all their problems!), ROM clashes are easily overcome, no fear of damaging the computer trying to fit them. ROMs can easily be swapped between machines.

1. Ensure the computer is switched off and unplugged at the mains.

2. Remove the four screws holding the cover. These are all underneath the machine. They are labelled 'Fix'.

3. Identify the ROM socket area. This can be found at the right-hand side of the main circuit board, just above the two cartridge slots (see figure 4 on page 53). It might be easier to move the plastic base for the cartridge slot – it simply lifts out and can be moved out of the way. Take care that the battery cannot short out on anything.

The operating system, Basic, DFS, *View* and *ViewSheet* are all in one big chip, the 'MegaROM' above socket A. ROM numbers 0 to 3 are normally mapped to the two cartridge slots and ROM numbers 4 to 7 are mapped to the three sockets.

Sockets A and C are 32k sockets and socket B is a 16k socket. Normally the four banks of sideways RAM are mapped to sockets A and C, so to put ROMs in them, links must be changed.

- link 19 is for socket A
- link 18 is for socket C

You should change them to the right to enable the ROM sockets.

4. Your ROM can be inserted into any of the sockets, though for the first 16k chip, clearly

socket B should be used. It must have the small notch pointing towards the left-hand side of the board.

5. Refit the cover.

6. Switch the machine back on and check that all is well. If not check that no pins have been bent on the chip.

MASTER DISC DRIVE PROBLEMS

Early Masters were supplied with the WD1770 disc controller chip. This is the same chip that was fitted into the BBC B+ and caused the loading problems with protected software which was designed to run with the old 8271 disc controller chip. Recently, Acorn changed the chip yet again, this time for the WD1772 disc controller chip. This chip is almost identical except it will not accept a wide range of track-to-track step times for the disc drive and those it will accept are the faster ones. On the BBC B and B+ the disc drive speed could be altered by changing two links on the keyboard. Normally, these links were set to the slowest speed on the BBC micro and increasing them (if using a modern 40 or 80 track drive) made some difference to loading times and also to the clicks and rattles the disc drive made. On the Master these 'links' are now part of the 'configure' routine and are set by *CONFIGURE FDRIVE. The 1772 controller works faster and old belt-driven drives will not work. Some of the cheap slim-line drives might not work either as they are also belt-driven.

Finding out which disc controller has been fitted is not easy, as it is situated under the keyboard.

*CONFIGURE FDRIVE should be followed by a number in the range 0-7:

	1770	1772
0 or 4	6ms	6ms
ADFS precompensation		
1 or 5	6ms	6ms
no ADFS precompensation		
2 or 6	30ms	3ms
ADFS precompensation		
3 or 7	30ms	3ms
no ADFS precompensation		

I frankly admit I do not have a clue what 'ADFS precompensation' is.

Problems can occur when using switchable drives in the 40 track mode, or when using 40 track disc drives. The cure is to set the *CONFIGURE correctly. Once this has been typed in, press CTRL-Break. It should be set to: *CONFIGURE FDRIVE 0 for a 40 track drive, or if you are going to use a 40/80 drive in the 40 track mode. You should find that *CONFIGURE FDRIVE 2 will probably also work if you have the 1772 disc controller fitted and are just using an 80 track disc drive. It is better to use the parameter 0, or 1 for more reliable operation and fewer nasty noises from the disc drive.

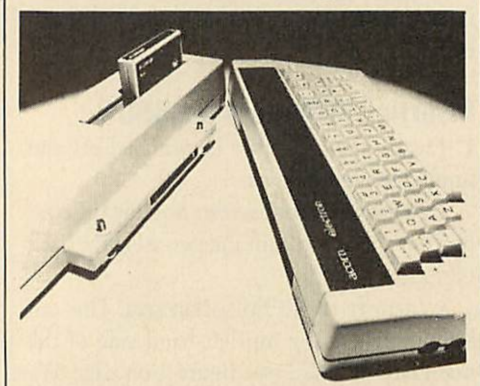
Finally it is worth noting that on a random-access file test of 700 records it was almost impossible to see any difference in speed when the FDRIVE parameter was changed (using a Master with the 1772). However, there was less creaking and groaning from the disc drive when the speed was increased. On a verify test there was a 10 per cent increase in speed between parameter 0 and 2.

MORE MASTER PROBLEMS

A fault I have encountered several times with the Master is that it will not work with a printer. Again this is a configure problem. If *CONFIGURE PRINT is set to 0, then the output to the printer is ignored. Set the parameter to 1 for a parallel printer, and 2 for a serial printer.

THE ELECTRON PLUS 1

Steve Forrester from Sevenoaks, Mr W Brambley from Sudbury and Marchino Sisi from Auchinleck have written in to say that the Plus 1 can be turned off if games will not



The Electron with Plus 1

run with it connected. First press Break and then type the following lines:

```
*FX163,128,1
?&212=&D6
?&213=&F1
?&2AC=0
```

Now load the program. The Plus 1 needs page &D for its workspace and as some games use this workspace, it must be turned off.

WATFORD DFS

Gordon James from Bristol has written in to ask if there is anything wrong with his disc filing system (DFS) because of the 'can't extend' problem. He will be pleased to hear that there is nothing wrong with the DFS in this respect, as all BBC DFSs suffer from this problem. The Watford DFS is better than most by making a more intelligent choice when finding space to put a file.

Briefly, the problem is that the DFS stores programs on a disc almost like a child writing a story in an exercise book. Now supposing the child does not finish that piece of work, leaves the rest of the page and starts the next page for the new work. That night the child takes the book home to finish the story, only to get to the bottom of the page and the story is still not complete. Where does she/he finish the story? This is the 'can't extend' error. The DFS stores a file on disc (new files always start on a new sector). If the previous file is to be extended, it only has room to fill the remainder of that sector, it then issues the 'can't extend' error.

There is no real solution to this problem. You can save the file by a new name each time, or delete the file first before saving, but this gets to be tedious. As Mr James is using *Wordwise*, he could cure this problem by buying *Wordwise Plus*. *Wordwise Plus* automatically first deletes a file before resaving it.

£10

PRINTING TELETEXT CHARACTERS

Edmundo Herrero from Santa Cruz in Tenerife wins £10 for his listing this month (see yellow pages). Inspired by December's tip on printing user-defined characters, he has sent in a listing to print teletext characters. The teletext characters available in mode 7 are from ASCII values 160 to 191 and 224 to 255.

INDENTING WITH WORDWISE

Wordwise is very easy to use, but as text is added in mode 7 and viewed in mode 0, it is not so simple to format a document correctly. This is particularly a problem when indenting. Many *Wordwise* documents I have loaded in from disc use the expedient of indenting the required amount by simply adding spaces. This tends to be rather tedious because you have to keep previewing the text and then

going back to the editor to get it right. The document is then difficult to edit as adding or deleting words upsets the formatting.

There is an easier way, well at least it is easier when you get used to it, and it does mean that it is not necessary to keep previewing the text.

```
Dear Sir

I refer to your recent letter and welcome the
flattering comments you have made about experts.
In reply, I would like to make the following
points.

   1. It is very difficult to prove that someone is
      an expert, however it is rather easy to find
      flaws in their arguments which prove that
      they are not an expert.

   2. An expert is someone who can convince his
      peers that he or she knows more than they do.

   3. Remember how the word "expert" is derived.
      "Ex" is a has-been, and spurt is a small
      drip.

Yours faithfully

I Knowitall
```

Example 1. A formatted *Wordwise* letter

Also editing becomes a delight because *Wordwise* will automatically format it. Consider the letter in example 1 above.

```
<f1> LM15 <f1> LL50 <f1> JO <f2>
Dear Sir

I refer to your recent letter and welcome the
flattering comments you have made about experts.
In reply, I would like to make the following
points.
<f1> IN5 <f2>
<f1> TI2 <f2> 1.  It is very difficult to prove
that someone is an expert, however it is rather
easy to find flaws in their arguments which prove
that they are not an expert.

<f1> TI2 <f2> 2. An expert is someone who can
convince his peers that he or she knows more than
they do.

<f1> TI2 <f2> 3. Remember how the word "expert" is
derived.  "Ex" is a has-been, and spurt is a small
drip.
<f1> CI <f2>

Yours faithfully

I Knowitall
```

Example 2. How to format the above letter

This letter can be formatted quite easily by starting new lines and then spacing in to the correct point. A better way is to use indents. These can be either temporary or permanent as shown in example 2.

The letter illustrates the use of both the indenting command and the left margin command. At the start of the letter, the left margin is set to 15 and the line length is set to 50. (The f1 and f2 in the example represent function keys 1 and 2.)

At this point in the letter justification is also switched on. Then after the first paragraph, the rest of the text is indented by five spaces. However, the first line of each new paragraph only needs to be indented by two spaces. Thus a temporary indent is put at the start of each new paragraph. The indents can be cancelled by the CI command.

By indenting this way, should an extra word or sentence be added, *Wordwise* will format it all correctly and ensure that it is justified and this ends all the problems.

ROM ARRANGEMENTS

Depending on your version of BBC computer the position of the sideways ROM sockets will vary. There are four versions of BBC computer namely the BBC B, the BBC B+ and BBC B+128, the Master Compact and the Master series – on each the ROM sockets are configured in a slightly different way. The Electron does not contain any spare sideways ROM sockets but these can be added by buying a ROM expansion board such as the Slogger ROM Box or the Sidewinder Board.

On the BBC range of computers you will need to remove the case lid to gain access to the ROM slots – doing this will not invalidate your warranty if the micro is still under guarantee.

ROM sockets are assigned numbers – this number refers to the ROM's priority in the micro. The BBC and Electron can support up to 16 ROMs, numbered from 0 to 15. The higher the number, the higher the ROM's priority in the machine. ROM priority is important – when the micro is switched on, the language (ie Basic) which has the highest priority will be selected. By re-arranging ROMs it is possible to make the micro select another language, eg, Logo or *View*.

Links are small push-on devices that are designed to connect sets of three pronged pins fixed to the main printed circuit board. In many cases they are used to configure ROM sockets in different ways thus a knowledge of them is important. The link will normally connect the centre pin of the three to an outside pin. Links are referred to in geographical terms, 'east', 'west', 'north' and 'south'. With the keyboard facing you, north is the rear of the machine, south is the front (nearest to you), west is to the left and east to the right. Placing a link in the east position simply means ensuring that the link is across the centre and east (right-hand) pin. Switch the machine off prior to changing links.

Standard BBC B

On a standard BBC B micro there are just four sideways ROM slots – one will contain the Basic ROM chip, leaving three for user use. If you have a disc interface fitted, it will require a DFS ROM thus reducing those available to two. The sideways ROM slots on a BBC B can be found on the lower right-hand side of the main PCB, just under the right-hand side of the keyboard. You will need to remove this to gain access. Figure 1 shows how they are arranged. The priority of the ROMs from right to left (outside to inside) is 15, 14, 13 and 12 and these may be 8k or 16k ROMs.

ROMs 0 to 11 may be added if desired by installing a ROM expansion board – details of which can be found in the comparative review by Chris Drage in the May 1986 *AU*.

BBC B+

On a B+ micro there are six sideways ROM sockets, located to the top left (back) of the PCB, arranged in two rows. Each of these sockets has a 32k capacity and occupies two ROM slot positions, therefore there appear to be 12 ROM slots to the MOS. Basic and MOS are combined into a single chip, OS-Basic, and this is fitted into the right-hand socket on the top row. This socket has priority number 15 and 14. Because this chip can-

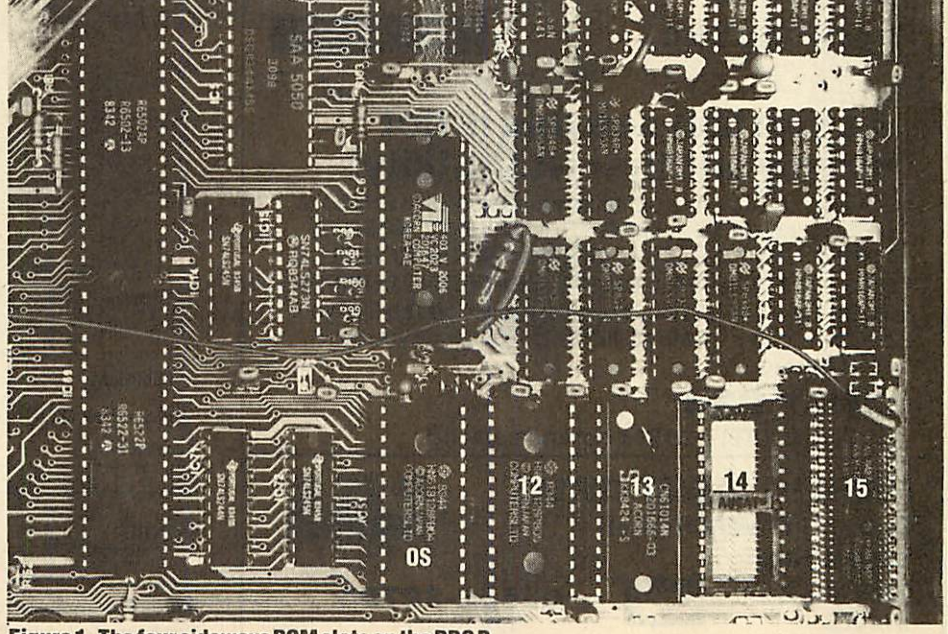


Figure 1. The four sideways ROM slots on the BBC B

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not be physically moved to another ROM slot, a mechanical means exists whereby its priority can be changed. This simply involves changing link 13's position on the printed circuit board. This will assign ROM priority 0 and 1 to the OSBasic chip.

The other five ROM sockets (labelled A,B,C,D and E) have the following priority numbers:

Key	ROM Socket	Link
A	10 and 11	18
B	8 and 9	15
C	6 and 7	12
D	4 and 5	11
E	2 and 3	9

Sockets 12 and 13 are not included and no provision has been made for them. As a DFS ROM is also included with the B+ only four

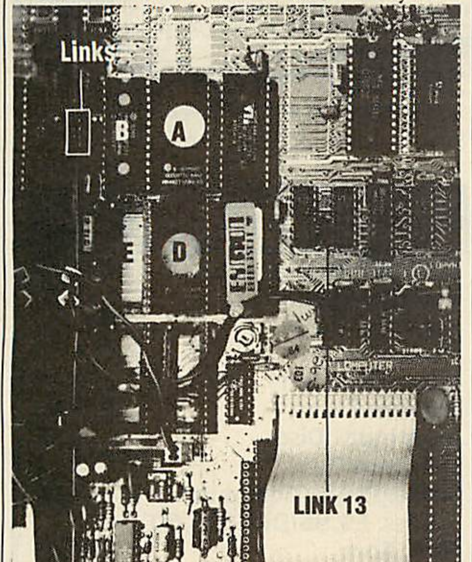


Figure 2. Five of the ROM sockets on the BBC B+

of the six sockets are available for use.

ROMs may be either 32k or 16/8k capacity and this must be selected via a link setting. There are five in all and the slots they affect are listed above. Normally these slots are set west in which case the ROM slots are in the 16/8k configuration and the odd priority number is assigned. By setting the link east, the 32k configuration is selected and both ROM identities are assumed.

The Master Compact

There are five ROM slots in the Master Compact. These are located down the lower right-hand edge of the PCB. The bottom-most socket contains a 64k ROM which houses the MOS, Basic and ADFS. Typing *ROMS shows that these occupy slots 15, 14 and 13 (&F,&E and &D in hexadecimal) as UTILS, Basic and ADFS.

The socket immediately above the OSBasic/ADFS chip is configured as a 32k socket and has ROM priority number 0 and 1.

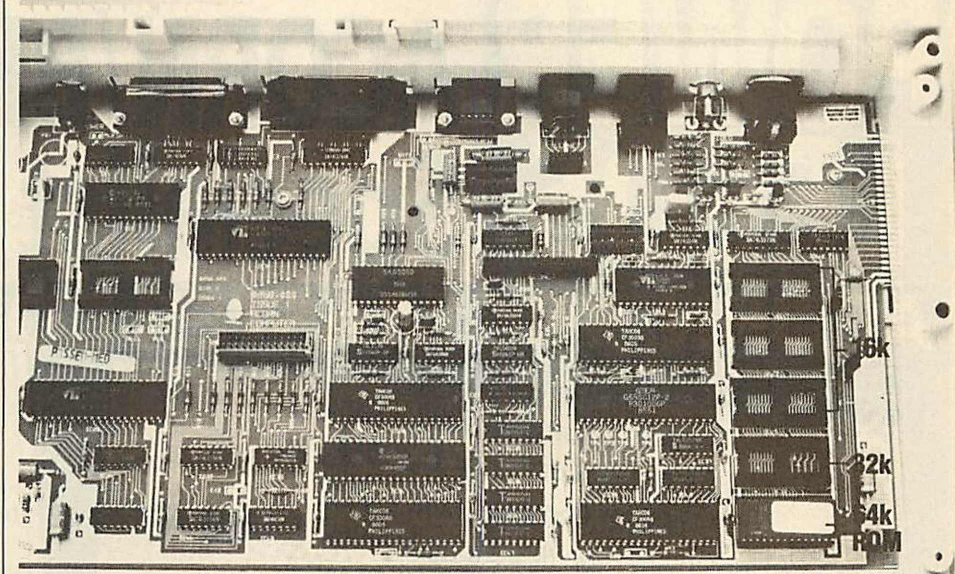


Figure 3. The 16k, 32k and 64k Master Compact ROMs

The remaining three sockets are all 16k sockets numbered 2,3 and 8.

Sideways RAM occupies ROM slots 4,5,6 and 7. Slots 9,10,11 and 12 are not normally available and would only appear in any future issue 64k ROM, for example upgrading to a 128k ROM.

Standard Master

There are just four ROM sockets on a standard Master series micro and these are located to the lower right-hand side of the PCB (just above the keyboard). The upper most of these will house the Megabit ROM which contains the MOS, Basic, ADFS, DFS, Edit and *View*, these occupy ROM slots 15,14,13,12,11,10 and 9 (&F-&9).

Figure 4 shows the position of the other three ROM slots and these are labelled A, B and C. The items in figure 4 labelled D and E are the cartridge slots. Both cartridge slots can take two 16k ROMs and they are given ROM priority numbers 0,1,2 and 3. Slot number B has ROM priority 8 and is the only dedicated 16k ROM slot in the Master.

The remaining two slots A and C are both 32k and take ROM priority 4/5 and 6/7. However the 64k of sideways RAM supplied in the Master is normally mapped in this position to allow 4*16k slots of sideways RAM images and as such the ROM slots themselves cannot normally be used. If the ROM sockets are required for use the sideways RAM can be 'removed' by setting link 18 (socket C) and link 19 (socket A) to the east position. These links are marked on the picture. Sideways RAM can be re-enabled by setting the links to the west position. Note that it is possible to mix ROM and RAM by changing just one link setting.

Electron ROM slots

The Electron does not contain any spare ROM slots for use, however they can be added. If you have a Plus 1 then a ROM cartridge may be purchased from Advanced Computer Products – this will enable 8k or 16k ROMs to be inserted via the cartridge.

If you do not have a Plus 1 then the Slogger ROM Box will give you not only several ROM slots but also the two cartridge slots, or the Sidewinders board may be used.

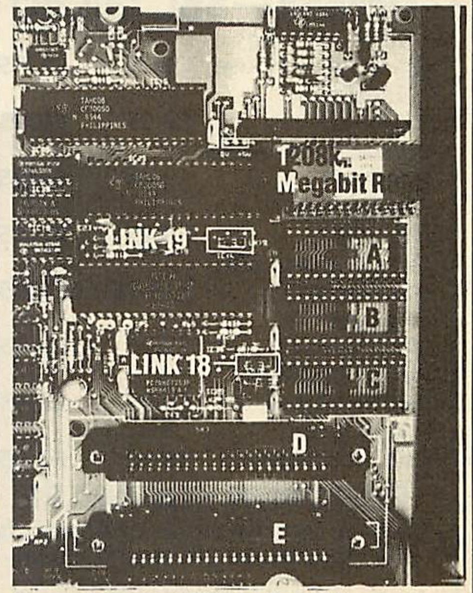


Figure 4. Master ROMs and cartridge slots

PRINTER COMMAND PERFORMANCE

You can select printer functions *before* loading a wordprocessor, so that an alternative print style can be used – useful with *View* where it's not easy to embed printer commands into the text.

FIRST BYTE

THE MOS EFFECT

This month we look at how to use the operating system and machine codes

Tessie Revivis

One of the most notable features of the BBC micro and Electron computers is their accessibility – virtually anything you want to do at machine level, you can. By machine level, I am really talking about the Machine Operating System – more commonly referred to as the MOS. The MOS is always present and acting in your micro and is independent of the task or language being run. In fact any program or language – be it playing *Repton* or writing a Basic program, relies on the MOS being present. The MOS for example is responsible for handling the screen display, printing characters on the screen, reading and recognising a key press on the keyboard, inputing text into a program or even a word-processor – in fact it would almost be true to say that languages such as Basic are being run by the MOS!

To allow all languages and machine code programs (not Basic programs as these interlink with the MOS via Basic) to use the facilities ready built into the MOS, a variety of entry points are built into the system. It is worth taking the time out to learn what functions the MOS provides, simply as it can save you time and effort in writing the assembly code to do it! For example, consider the single line Basic program:

10 key=GET

If you run this, the program will wait for you to press any key on the keyboard. Simple enough, but how would you write this in assembly language for incorporation into a machine code program? The answer is, you don't! You use the Operating System Read Character routine (OSRDCH) in the MOS. This routine is located at address &FFEO, so all we need to do is a JSR &FFEO as the following program (listing 1) demonstrates.

```
 10 REM First Byte listing 1
 20 REM Simulate GET
 30 :
 40 DIM code% 100
 50 P%=code%
 60 [.key
 70 JSR &FFEO
 80 RTS
 90 ]
100 CALL key
```

Listing 1. Simulating Basic's GET

Type this in, RUN it and the effect is exactly the same as our one-liner earlier on.

In the previous two months we have used a couple of other MOS based routines, namely to print the character currently in the accumulator, this was done with one of the following two calls, JSR &FFEE or JSR &FFE3. Respectively, these are the Operating System Write Character routine (OSWRCH) and the Operating System ASCII character routine (OSASCI). They are, in effect, identical except that the latter should be used if you wish to print a Return on the screen with ASCII code 13 in the accumulator. Listing 2 below illustrates the printing of the letter A utilising the OSWRCH routine.

```
 10 REM First Byte listing 2
 20 REM Print with OSWRCH
 30 DIM code% 100
 40 P%=code%
 50 [.print
 60 LDA #ASC"A"
 70 JSR &FFEE
 80 RTS
 90 ]
100 CALL
```

Listing 2. Using OSWRCH to print a character

An easy way of generating a line space is the OSNEWL routine (Operating System New Line). This is done by calling address &FFE7 in your program, ie JSR &FFE7. Add the following line to listing 2 above:

65 JSR &FFE7

and run it again to see that an extra blank line is indeed generated.

Another useful routine to have knowledge of is the Operating System Command Line Interpreter routine (OSCLI) at &FFF7. OSCLI allows you to access any of the * commands that your micro may be capable of from machine code. As with all OS commands it is easy to use. There are just two things to remember. First, the OS command minus the * and terminated by an ASCII return character, ie 13, must be placed in the memory and secondly the index registers X and Y must be made to point to the string. With this done the routine can be called and the task performed. Listing 3 demonstrates OSCLI to perform a *HELP. The command Help (minus the *) and followed by a 13 (Return) character are stored at 'command' (lines 90 to 150). The index registers are pointed to this (lines 50 and 60) so that the low byte of the Help strings address is in the X register and the high byte in the Y register – this is aided by use of the MOD and DIV functions – note also the use of immediate addressing (see last month's First Byte). The JSR &FFF7 then performs the *HELP. Try it and see. Substitute your own command string in line 110 to experiment, ie CAT to catalogue a disc. If you have *UserDump* or *UserROM* you can use their facilities in this way from machine code – or in fact those of any other sideways ROM you may have!

```
 10 REM First Byte listing 3
 20 REM Perform OSCLI
 30 DIM code% 100
 40 FOR pass=0 TO 3 STEP3
 50 P%=code%
 60 [OPT pass
 70 .oscli
 80 LDX #command MOD 256
 90 LDY #command DIV 256
100 JSR &FFF7
110 RTS
120 .command
130 ]
140 $P%="HELP"
150 P%=P%+LEN$P%
160 ?P%=13
170 NEXT pass
180 CALL oscli
```

Listing 3. Performing a '*' command

Osbyte calls allow you to control individual components of the way in which your micro functions – you may also use them to gain information about your particular machine. Osbyte calls are normally available from the keyboard or from a program by use of the *FX command. There are many Osbyte calls and so each is allocated a number starting at 0 up to 255 – not all are used though. For example type the following at the keyboard:

*FXO

when you press Return the version number of your OS (MOS) will be displayed. On my BBC it returns:

OS 1.20

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and Osbyte (FX) calls can take place from machine code – the address of the routine is at &FFF4, and prior to it being called, the FX number should be placed in the accumulator. *FX0 in assembler is shown in listing 4.

```
 10 REM First Byte listing 4
 20 REM Perform *FX 0
 30 DIM code% 100
 40 P%=code%
 50 [.fx0
 60 LDA #0
 70 LDX #0
 80 LDY #0
 90 JMP &FFF4
100 ]
110 CALL fx0
```

Listing 4. Displays operating system number

Other FX calls have far more practical applications. *FX3 allows you to enable or disable an output stream – this being simply a flow of information from the computer. The VDU driver for instance is an output stream, as it sends signals to your TV or monitor. This particular stream can be disabled with the command *FX3,2. Don't type that in yet, first define two function keys thus:

*KEY0 *FX3,2:M

*KEY1 *FX3:M

Press f0 and no further information is sent to the screen – the computer will still function however – press f1 to restore the status quo. In this case we have used an extra parameter in the FX call, in fact we can use up to three parameters. In assembler the first number represents the accumulator contents, the second the X register contents and the third, if any, the Y register contents. In assembler the command *FX3,2 is performed as shown in listing 5 below.

```
 10 REM First Byte listing 5
 20 REM Perform *FX 3,2
 30 DIM code% 100
 40 P%=code%
 50 [.fx3
 60 LDA #3
 70 LDX #2
 80 LDY #0
 90 JMP &FFF4
100 ]
110 CALL fx3
```

Listing 5. Disabling the screen number

Another interesting (and good for pranks) *FX call is *FX11 – this can be used to vary the rate at which the keyboard will autorepeat. Normally when you keep a key depressed it will be repeated after 32 hundredths of a second – lowering this figure makes it impossible to type properly – try *FX11,1 (its worth defining an function key with *FX11,32 first!).

Some FX calls can be used to simulate Basic functions at machine level. For example *FX129 performs an INKEY. Here the INKEY value must be passed to the MOS via the index registers.

The following assembler program (listing 6) performs the equivalent of INKEY (&7FFF), ie, it waits for up to five and a half minutes for a key to be pressed.

```
 10 REM First Byte listing 6
 20 REM Simulate INKEY
 30 DIM code% 100
 40 P%=code%
 50 [.inkey
 60 LDX #&FF
 70 LDY #&7F
 80 LDA #&81
 90 JSR &FFF4
100 RTS
110 ]
120 CALL inkey
```

Listing 6. INKEY simulation

Some FX calls can also return two items of information using the X and Y registers. *FX135 for instance will return the value of the character under the cursor and the current mode number via the X and Y registers respectively. The value of the character is in fact its ASCII code. This is a most useful call and listing 7 shows how it is implemented.

```
 10 REM First Byte listing 7
 20 REM Read Mode, Character
 30 DIM code% 100
 40 P%=code%
 50 [.key
 60 LDA #&87
 70 JSR &FFF4
 80 STX &70
 90 STY &71
100 RTS
110 ]
120 @%=0
130 MODE 131
140 PRINT"ABCDEFGHIJK"'''
150 VDU 30
160 CALL key
170 PRINT'''''
180 PRINT"Ascii Code:&"~?&70
190 PRINT"Mode number:"?&71
```

Listing 7. Reading a screen character

There are another set of MOS calls available for use – these are the Osword calls and the routine lies at address &FFF1. These calls are used to transfer blocks of information via a parameter block. The parameter block must be defined and set up as required before the routine is called. The X and Y registers are used to pass the start address of the parameter block while the accumulator holds the Osword Call number.

Listing 8 shows how Osword call can be used to perform the equivalent of the SOUND command – the program in fact does SOUND 1,-15,200,20.

The parameter block in the program is the position after the main assembler – which is again very simple to set up – the BRK mnemonic is used simply to reserve a single byte, as each item requires two bytes of space two BRK's are used. The opcode for BRK is &00, so is quite convenient. Finally the ! operator is used to write the information into the parameter block prior to executing the call.

```
 10 REM First Byte listing 8
 20 REM SOUND 1,-15,200,20
 30 DIM code% 100
 40 FOR pass=0 TO 3 STEP3
 50 P%=code%
 60 [OPT pass
 70 .osword1
 80 LDX #sound MOD 256
 90 LDY #sound DIV 256
100 LDA #7
110 JSR &FFF1
120 RTS
130 .sound
140 BRK:BRK
150 .amplitude
160 BRK:BRK
170 .pitch
180 BRK:BRK
190 .duration
200 BRK:BRK
210 ]
220 NEXT
230 !sound=1
240 !amplitude=-15
250 !pitch=200
260 !duration=20
270 CALL osword1
```

Listing 8. Simulating Basic's SOUND

The programs and examples presented so far are very insular in that they really perform just a single specific operation – the real fun comes when playing with the information extracted. Normally, when letters are presented on screen each letter occupies the same amount of space. The letter 1 uses up the same amount of screen space as the letter M which is clearly much bigger. A much more presentable type can be obtained using proportional characters – here the letter 1 takes up less room than the letter M and gives a much neater appearance. Listing 9 (on the yellow pages) uses Osword call 9 to read a letters definition and strip off any unwanted spaces either side of it before plotting it on screen (it does not work in Mode 7). The end results are, I think you'll agree, very nice!

To use the Osbyte and Osword calls you will need to have access to a book describing them. The Electron, BBC B and BBC B+ manuals all outline the more important calls – the *Advanced User Guide* (Bray, Dickens and Holms) or the *BBC Advanced Reference Guide* (Smith) are useful and both contain more detailed lists. For Master owners then the *Reference Guide Part 1* contains full details on all the MOS routines.

1

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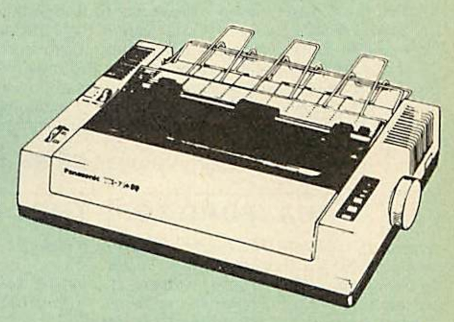
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- *DDFS Manual* *(no VAT)* **£6.95**
- *We will exchange your existing Single Density DFS Kit for our DDFS Unit at* **£35**

Watford Electronics DDFS PLUS for the BBC B Plus

The Watford DDFS Plus, written specifically for the BBC B Plus Microcomputer, replaces the 1770 DFS from Acorn. It not only provides BOTH, single and double density operations in DFS mode, but the DDFS Plus also permits the use of an extended catalogue, giving 62 files per catalogue. *It* also incorporates all those excellent features of the popular Watford DFSs, and more.

N.B. SRAM and Tube functions not duplicated.

DDFS PLUS (for BBC Plus) **£30**
(Price includes comprehensive manual)

MYSTERIES OF DISC DRIVES & DFS REVEALED

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems..

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive? What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin? What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

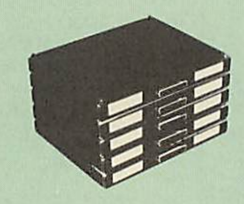
Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford's new book entitled 'MYSTERIES of DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

£5.95 (Book No VAT)

DISC ALBUMS **£4**

Attractively finished in antique brown leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

STAK-PAK



The unique computer program filing and storage system. Made of tough black plastic, these compact drawer sections hold two cassettes each and lock together vertically to form miniature cabinets of any height. Each drawer section has two C12 Data Cassettes with labels plus external index card.

Five twin Packs incl.
10 Cassettes Only: **£5**

FLOPPY HEAD CLEANER KIT

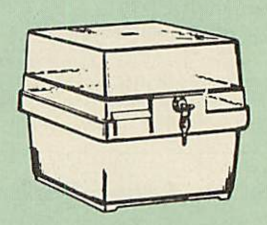
The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use.

£8

LOCKABLE DISC STORAGE UNITS

Strong plastic case that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

M35 – holds upto 50 discs **£8**
M85 – holds upto 95 discs **£11**



PLASTIC LIBRARY CASES

FOR 5¼" DISC STORAGE holds 10 Discs. **£2.00**

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates the single density capacity. The double density storage capacity is second one, (that within the brackets). All disc Drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). Both are of Japanese manufacture.

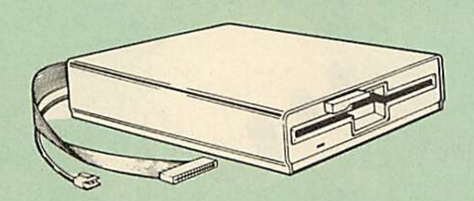
All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. *Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

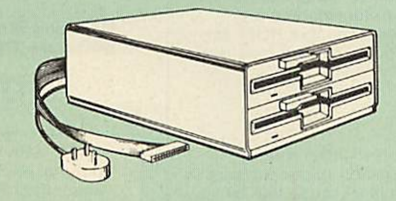
Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high quality JVC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate: extensive tests within our workshops have confirmed this. All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. (Ideal for Schools & Colleges. We are now able to supply all single disc drives in Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives; allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below for single drives is for a single drive in a standard single case. Single drive in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space; your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. *(Turn to the 10th page of our advert for the Plinths).*





Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £89		CS 200 £99	
400K (720K)	CLS400S £97	CLD400 £165	CS 400S £110	CD400 £189
800K (1.44M)		CLD 800S £183		CD 800S £205

● TWIN Disc Drive Case, complete with Power Supply & Cables **£35**
Securicor carriage on Disc Drives £6

Prefix **C** = *Cased Drive*
L = *Less PSU*
S = *Single*
D = *Double*

Suffix **S** = *40/80 Switchable*

e.g. CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40/80 track).

3M – DISKETTES

Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

- *10 × 5¼" S/S D/D 40 Track Diskettes* **£10**
- *10 × 5¼" D/S D/D 40 Track Diskettes* **£12**
- *10 × 5¼" S/S D/D 80 Track Diskettes* **£17**
- *10 × 5¼" D/S D/D 80 Track Diskettes* **£17**
- *Hi-Density 1.6M D/S D/D for IBM* **£32**
- *10 × 3½" S/S D/D 40/80 track Discs* **£20**
- *10 × 3½" D/D D/D 40/80 track Discs* **£27**

3½" (FREE with every pack of 10 3M Discs, a handy Durabeam Torch) While stocks last.

TOP QUALITY 5¼" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

- *10 ×* **M4** *S-S D/D 40 Track Discs* **£9**
- *10 ×* **M5** *D/S D/D 40 Track Discs* **£11**
- *10 ×* **M7** *D/S D/D 80 Track Discs* **£15**

- *3" Double Sided Discs* **£4** *each*

Special BULK OFFER on 5¼" DISCS

(Supplied packed in plastic storage Units)
(Lifetime warranty on Discs)

Type	Description	Pack of 20	Pack of 50
M4	Single/Side Double/Density 48TPI	£16	£40
M5	Double/Side Double/Density 48TPI	£20	£52
M7	Double/Side Double/Density 96TPI	£27	£65

DUST COVERS (For our Disc Drives)

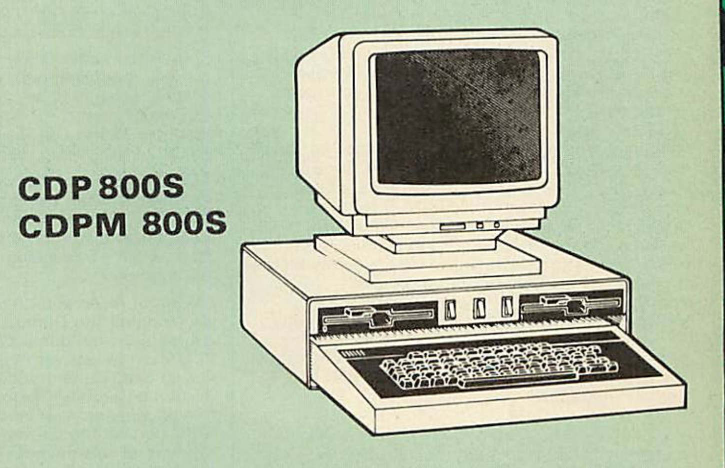
Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

ACORN WINCHESTER DRIVES

Suitable for direct connection, via the 1MHz bus, to any BBC running ADFS. These Acorn Winchester disc drives are fast and extremely reliable. Each Winchester comes complete with the Level III Econet File Server software.

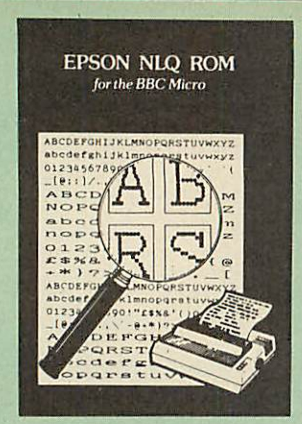
10 Megabytes **£1050**; 30 Megabytes **£1549**

CDP 800S
CDPM 800S



Twin 800K Double sided 40/80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £235
CDPM 800S for Master £245
(Securicor Carr. £7)



Harness the full potentials of your Epson RX & FX Printers. Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:
- Simply type *NLQ80/100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set; Standard 'pica size'; Proportional spacing; Enlarged; Underlined; Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £25

VIEW PRINTER DRIVER for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM.
A must for all VIEW and NLQ ROM users.

£7.00
(Hi-View compatible)

THE NLQ DESIGNER

(The First & still the Best)

KAGA KP810/910 and Canon PW1080 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! For the BBC Micro. This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your printer so that it is available immediately when you turn it on. Downloadable Fonts require 6264 RAM chip fitted. Now BBC Master compatible.

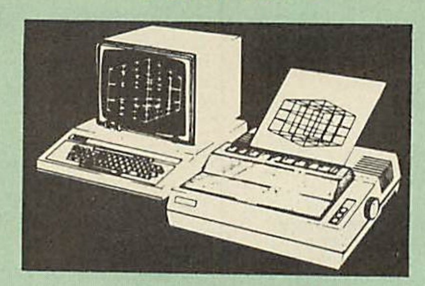
A 40 or 80 track (please specify) FONT Disc containing 10 Fonts, (Italic, Courier, Courier Italic, Script, Copper Plate, Shadow, Bold, Double Print, Gothic and Greek is now supplied FREE with every package.

(P.S. This ROM is not suitable for Epson printer

- NLQ Designer ROM & FONT Disc **£25**
- Kaga Individual FONT ROMs **£15**

(Write in for further details).

DUMPOUT 3



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.
Two commands are used to operate the dump routines:
*GIMAGE – This provides a full graphics dump of any graphics mode, plus modes 7 and '8'. There are many optional parameters but you need only specify the parameters you wish to change.

Features available include:
- Vertical and horizontal scaling through all the graphic modes and mode 7
- Rotation of the image produced through 90, 180 and 270 degrees
- Left hand indentation setting
- Screen dump window definition
- Colour grey scaling
- Two tone fast dump
- Special colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered dumps
- User port switched dumps

What does the independent press say!

Practical Electronics, May 1985
"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro . . .".

"an extremely sophisticated and powerful dump utility".

"VERDICT – Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out of your dot matrix printer".

The Micro User Feb. 1985.
"Well, here is that winner"!

"provide(s) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)

"The versatility of *GIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

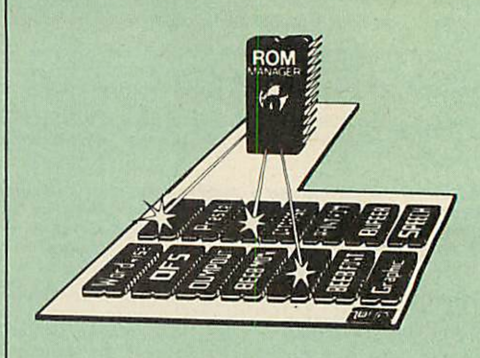
"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £25 it must represent excellent value for money and surely cannot be beaten".

Designed for use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Mannesman Tally etc.
Price including comprehensive manual

£25

ROM MANAGER



Probably the most powerful way of expanding the BBC micro is from the use of Sideways ROMs. One problem faced by the avid ROM collector is that of ROM command clashes. The solution is very simple in the form of the ROM that "Provides comprehensive management of all your installed ROMs". (Quote from BEEBUG November '84.)

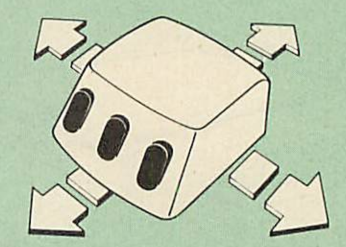
Basically, ROM Manager offers you the ability to turn off any installed ROM, or to send any * command to any specific installed ROM. It is said that imitation is the sincerest form of flattery – Acorn's BBC Plus features many of the abilities of this powerful ROM.

Many more facilities available.

SPECIAL OFFER £18

THE AMX MOUSE

The AMX Mouse needs no introduction. It is simply the best.



Now supplied with the NEW SUPERART Software ROM & Disc at no extra cost.

ONLY: £65 (carr £1.50)

FREE With every AMX Mouse package purchased from us, we are giving away, absolutely **FREE**, our popular Colour Art software package worth **£15.**

AMX DESK Package	**£19.00**
AMX UTILITY Package	**£11.00**
AMX SUPERART Package	**£42**
AMX PAGE-MAKER Pack	**£42**
AMX 3D ZICON Disc	**£20**
AMX Database Disc	**£20**
AMX XAM Educational	**£20**

RB2 MARCONI TRACKER BALL

This popular unit is supplied complete with software.

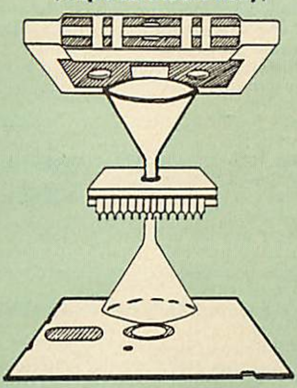
Price: **£50**

FLEET STREET EDITOR

Software pack **£35**

TRANSFEROM

(Tape to Disc Utility)



Not compatible with 1770 DFS.

This advanced and sophisticated utility ROM for the BBC Micro has the following features:

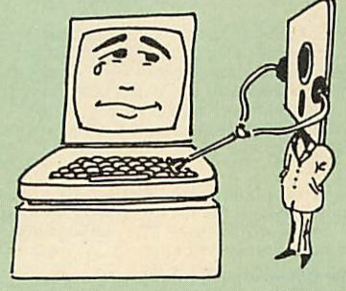
- Fully menu driven for ease of use
- Copes with locked programs
- A very comprehensive built in copying features
- Copies very long adventure games
- Supplied with comprehensive manual

TRANSFEROM is now available in BOTH single and double density versions. The single density version works with both the Acorn and Watford single density DFSs. The double density version works with the Watford DDFS system only.

TRANSFEROM takes your software on tape and saves them onto disc. TRANSFEROM does not stop when one disc is full; you just insert another disc in and carry on with that one! Surely this is the most valuable investment you could make if you have tape software that you wish to transfer to disc! Please specify version required – Single or Double Density.

£25.00

DIAGNOSTICS DISC



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large deqree of patience or to find your nearest dealer ana pay him to find out what is wrong.

At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

ROMAS

THE CROSS ASSEMBLER AND MACRO EDITOR FOR SERIOUS PROGRAMMERS!

ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

6502, 65C02, Z80, 8085, 8041, 6809 and Z8 P.S. This includes the Acorn 6502 & Z80.

ROMAS features a powerful expression analyser, making complex table easy to generate. To aid in documentation, fully formatted assembly listings may be produced, with full symbol table output at the end.

ROMAS is provided with a powerful cross referancer to produce a listing of all the labels in a given "source" program; this makes it easy to check to see if you are about to duplicate a label.

The Macro Editor

Features of this powerful editor provided with the ROMAS package include:

- Works in all 40 and 80 column screen modes
- Fast load and save speeds
- Continuous line and column number displays
- Search, replace and move; all available in macros
- Command repetition

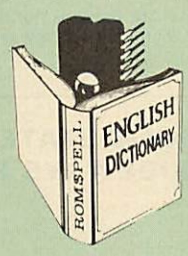
The ROMAS package includes a comprehensive manual, providing detailed documentation and plenty of examples.

A give away at . . . **Only £45**

Please specify 40 or 80 track disc when ordering.

ROM-SPELL

"way ahead of any competition"



ROM-SPELL is probably THE most advanced and fastest spelling checker available for the BBC Micro. Printed below are some extracts from a recent independent review (A&B Computing Nov. '85), which we feel sure will convince you that this is THE only spelling checker worth considering.

"The editing system is very neat and simple, instead of replying to queries and beeps all of the time . . ."

"The other feature which places ROM-SPELL way in front of any competition is the ability to examine the user dictionary, so any spelling mistakes that have found themselves on the disc can be examined and taken out if necessary".

". . . that it is compatible with many of the popular word processors on the market is a good indication that ROM-SPELL is going to be a very popular product indeed".

". . . ROM-SPELL is by far the best spelling checker for the unexpanded BBC B (with or without word processor). It boasts features which are hard to find on conventional spellcheckers on CP/M and MSDOS, namely Spellstar and has a speed/performance ratio of roughly the same as its CP/M cousin. The difference is that the CP/M version would cost the best part of £500".

". . . and with such vital house keeping features as an ambiguous word checker, the ability to edit the user dictionary, a comprehensive manual that is both easy to read and actually ENJOYABLE to learn from, . . . I feel confident that ROM-SPELL will woo the word processing public with no problems at all".

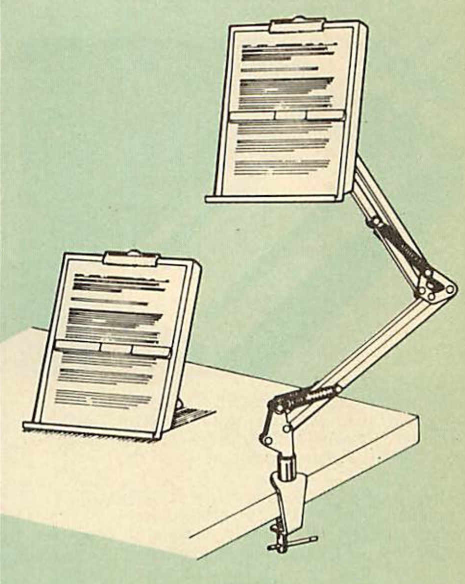
Compatible with: View, Wordwise & Wordwise

Don't settle for less, Buy the best.

£25

(Not compatible with 1770 DFS)
(Please state 40 or 80 track disc)

COPY HOLDERS



How often have you been about to type hand written notes into your computer when you find that there's nowhere to rest the paper or that your notes are resting at the wrong angle to read the type? Whether the notes be your latest program or the draft of a new trilogy, the new Manuscript Holders from Watford are superb for holding your paper at the ideal height and angle to allow you read and type in ease and comfort.

Available in desk resting and shelf clamping versions, these two units hold your paper firmly by means of a magnetic ruler and a clip grip.

Mounting to a convenient flat surface, the two joint anglepoise Manuscript Holder allows the paper to be positioned at virtually any convenient angle whilst only taking up a fraction of the surface area that the paper being held does.

The smaller desk resting Manuscript Holder is useful for the more organised desk where the problem is simply holding the paper at the right angle.

Whatever desk arrangement you use, surely you deserve a Watford Manuscript Hoider!

Amazing value at only
Desk Top **£10** (carr. £2)
Angle poise **£14** *(carr. £3)*

All prices in this advert are exclusive of VAT.

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£13 (40 or 80 track)

BEEBMON

The most powerful machine code monitor for the BBC Micro **£24.**

DISASSEMBLER ROM

ONLY **£16**

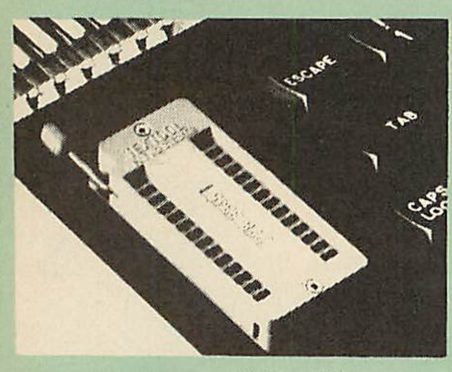
THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering.

Only **£20**

Continued


SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£15** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack.

Complete System **£12**
Spare Cartridges **£2.50**
Spare Rack **£1.50**

16K Sideways RAM Modules

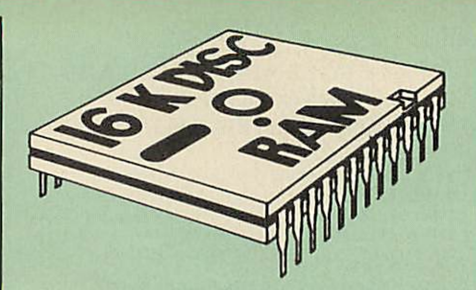
This is it! The revolutionary design RAM Module you've been waiting for. Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional extras

READ and WRITE protect Switches **£2** each
Battery for Battery Backup **£3**



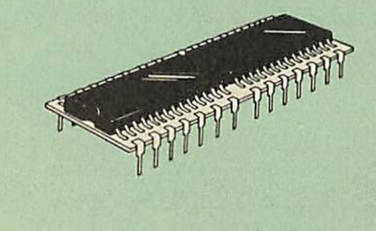
This is the RAM you've been waiting for!! This battery backed up, write protectable 16K sideways RAM board allows you to run from disk every sideways ROM available. Beware of other sideways RAM boards which are not backed up as certain ROMs will not run in these boards even though the RAM can be write protected. The Battery Backup facility allows retention of DATA after power off. On switch on the Micro will think the WATFORD DISC RAM is a ROM. Features available are:

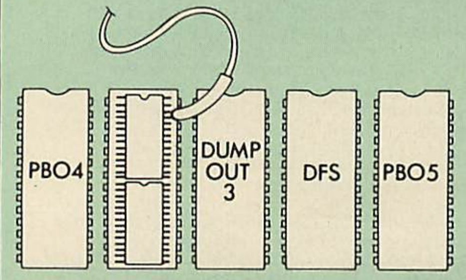
- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.
- Disk software can be copied onto other discs when disc is full.
- No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally.
- Can also be used as 16K printer buffer RAM in conjunction with our Buffer & Backup ROM.

New Low Price: £30 (carr £2)

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board.

SOLID STATE 16K SIDEWAYS RAM





This new unit from Watford, which utilises the latest in Static RAM technology, offers 16k of easy-fit sideways RAM in a very compact unit with a footprint no larger than a standard 28pin EPROM. With only a single flying lead terminating in a mini hook-on probe, to fit, (no soldering required) this compact unit works with any BBC Micro with or without a ROM board. ***Compatible with BBC B Plus.*** Like our other 16K RAM Modules, this unit is very simple to fit.

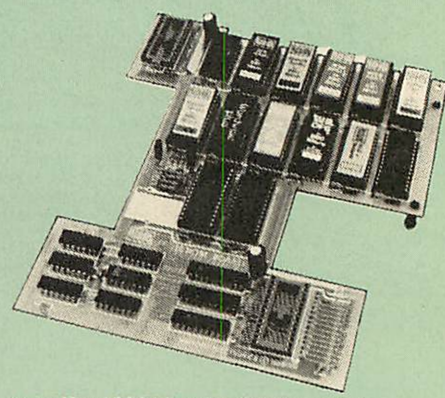
Only **£28** (carr 2)
Supplied complete with comprehensive software on Disc, Operating and fitting instructions.

Do you find the 16K Sideways RAM Units confusing? If so, we have compiled this quick questionnaire to help YOU decide which is the best one for you. If the answer to any of the questions is yes, then use the index number to select from the boards below. Options in brackets indicate possible secondary choices.
Do you require:

- Sideways RAM for a BBC B? Choose 1, 2 or 3.
- Sideways RAM for the B+? Choose 3.
- A small, basic module? Choose 3.
- A sideways RAM module for a ROM board? Choose 1 or 3.
- An easy to use utilities disc? Choose 1, 2 or 3.
- More than one module installed at once? Choose 1 or 3.
- To use sideways RAM as a printer buffer? Choose 1 or 3.
- Battery Backup? Choose (1) or 2.
- Write protect for RAM (makes ROM look like RAM)? Choose (1) or 2.
- Read protect (allows recovery from crashes)? Choose 1.

Key:
1) 16k Sideways RAM Module
2) 16k Disc RAM
3) Solid State 16k Sideways RAM

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16. Also permissable, are various configurations of RAM (up to 16k) and different sized EPROMs (see below).

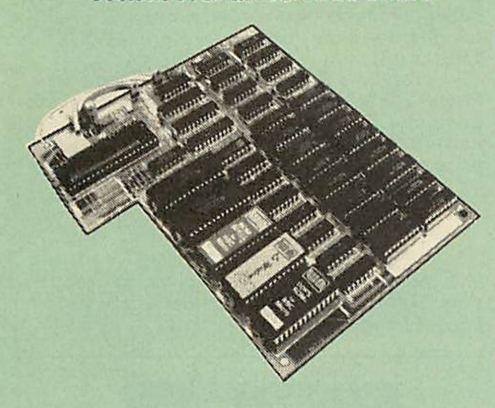
Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 can take the following chips: 2716, 2732, 2764, 27128, 6116, 6264.
- Read protect to make RAM "Vanish"; allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
(carriage £2)

Watford ROM/RAM CARD

A must for all serious users



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM/RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM/RAM Board.

The ROM/RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, should the user wish to upgrade in the future. Please write in for further details.

INTRODUCTORY PRICES:

● *ROM/RAM card with 32k dynamic RAM*	*£43*
● *ROM/RAM card with 64k dynamic RAM*	*£59*
● *ROM/RAM card with a massive 128k dynamic RAM*	*£89*
(carriage on ROM/RAM Card £3)	

OPTIONAL EXTRAS:

● *16k plug-in Static RAM kit*	*£6*
● *Battery backup*	*£3*
● *Read and Write protect switches*	*£2 each*
Complete ROM/RAM board (all options installed)	*£99*
● *16k Dynamic RAM for Upgrade*	*£7.50*

Le Modem



The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World/wide data transfer system.*
- *Auto Dials, Auto Answers, and is completely controlled by your Micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELESOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON/OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- *FREE 3 months subscription to MicroLink.*

- *BT Approval applied for.*

Price: £89
(carr £3)

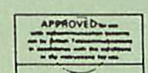
PROHIBITED from direct or indirect connection to any telecommunication system run by British Telecommunications. Action may be taken against anyone so connecting this apparatus

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

Nightingale Modem

SPECIAL PRICE to our Customers

£99
(carr £3)



(Price includes: Nightingale Modem, Commstar ROM pack, Cables & Comprehensive manual)

Nightingale Modem without software	**Only £87**
COMMSTAR ROM package only (P&P on modem £2.00)	**£29**
Auto Dial/Auto Answer Board (non BABT)	**£48**
Auto Dial Utilities Disc	**£9.50**
OBBS Bulletin Software	**£20.00**

APOLLO



The NEW Modem from Wtford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost – High Performance modem with Auto Dial & Auto Answer facilities as standard; we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200/1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.

The Apollo is attractively finished in matt black. It opens the doors to world communication to boht, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

Special Launch Price: **£75 (Carr £3)**
(Write in for full specification)

Viglen Console Unit

Enhance the appearance and convenience of your BBC Micro with the Viglen console unit.

£42 (carr. £4)

BT TELEPHONE CONNECTORS

LJU 1/4A Mini Line Master	**£4.50**
LJU 1/6A Mini Line Slave	**£3.00**
LJU 2/4A Line Master	**£4.00**
LJU 2/6A Line Slave	**£2.50**
LJU 3/4A Flush Master	**£3.95**
LJU 3/6A Flush Slave	**£2.75**
LJU 10/3A Dual Splitter	**£5.50**
4 Way BT Plug	**£0.75**

Versatile BEEB SPEECH SYNTHESISER Unit



The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued



COMPUTER CONCEPT'S ROMS

ACCELERATOR	£48
CARETAKER Basic Utility	£27
Graphics ROM	£23
Disc Doctor ROM	£24
TERMI	£27
COMMUNICATOR	£49
SPEECH ROM	£26
Printmaster	£24

Wordwise £25

Wordwise plus

£40

We are giving away absolutely **FREE,** the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text/segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS
Supplied on disc. This version requires a WORDWISE-PLUS ROM to be present in the machine. It gives up to 44k of text space on the 6502 2nd processor.

£5

Inter SHEET £40



ONLY: £26

Inter-WORD

Only: £46

Special Discount price for the existing Wordwise Plus owners. Simply quote your reg. number and pay.

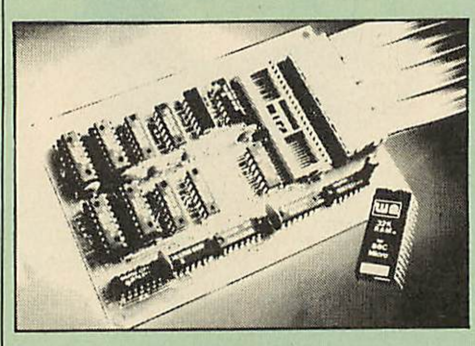
Only: **£39**

All Prices Exclusive of VAT

32K

SHADOW RAM-Printer Buffer

Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B+ or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.

- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.

- Ensure COMPATIBILITY with a vast range of hardware (including our ROM board, the ATPL ROM boards, double density boards, second processors), and software (including BASIC, TOOLKIT, VIEW, WORDWISE (1.20+), WORDWISE-PLUS, Music 500's AMPLE). This is because our board, unlike those of our competitors, is connected to the computer by a ribbon cable and has the power consumption of a couple of ROMs!

- Achieve EASY OPERATION with ROM based software. A large range of commands is available for machine code and BASIC users, including some useful *HELP messages, and a comprehensive manual is supplied free.

- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only: £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

INCREDIBLE WORD PROCESSING DEAL ! ! !

Watford Electronics, already renowned for quality products at discount prices, are offering, the truly spectacular BARGAIN OF THE YEAR!

A Watford's 32K Shadow RAM Card – Printer Buffer and the much sought after, Computor Concepts' Inter-WORD, (a very powerful package) All this at an astounding price of:

Only £75 (carr £2)

(P.S. For an extra £14, we will include Word-Aid ROM package for the Wordwise Plus, if bought at the same time.)

VIEW

VIEW WORDPROCESSOR 2.1 .... **£37**

VIEW 3.0 ROM

Price: Only **£56**

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£36

VIEWSHEET (Acornsoft)	**£37**
VIEWSTORE	**£37**
VIEWSPELL	**£29**
VIEWPLOT Disc	**£22**
VIEW-INDEX	**£14**

Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP

Only £10

VIEW DRIVERS FOR JUKI & BROTHER HR15 PRINTERS

Only £10

VIEW/VIEW SHEET PRINTER DRIVER for SILVER REED

(Officially approved by Silver Reed)

Only: £10

SPECIAL OFFER
Acorn's Speech Synthesiser Package

Complete with manual in its original packaging

Clearance price Only: **£19**



ARIES CORNER

Aries Computers was the first company to commercially market what is now known as SHADOW RAM. As part of it's continued expansion policy, Watford Electronics is proud to announce that the Aries range is now available exclusively from Watford Electronics and their dealers.

The Aries range, designed by experts offers you the solution to your upgrade nightmares. All the Aries products are compatible with double density disc controllers, modems, second processors, ECONET, hard discs, EPROM programmers and of course, other members of the Aries family and most of the much wider Watford family (some products advertised here perform identical functions and hence cannot be used together). Several major companies now test all their products to ensure compatibility with the Aries B20 & B32.

In quality of construction, the Aries range sits alongside the Watford range in setting a standard against which others are judged. Custom made connectors eliminate the damage to the BBC machine caused by inferior products.

The Aries B-32 Shadow RAM Card

18 months of intensive research and development have produced a worthy successor to the widely acclaimed Aries-B20; the revolutionary Aries-B32. This 'second generation' expansion board features 32k of RAM and a 16k ROM socket.

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus and many othr applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

Price: B-32 **£80** (carr. £2)

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries B-20 and the Aries B-32. For the business user or educationalist, the compact and secure internal fitting is ideal, with the ROM board tucked neatly inside the lid where it will not cause overheating problems. The serious software developer and the hobbyist may prefer to mount the board externally, giving instant access to the sockets for experimental purposes. A zero-insertion force (ZIF) sofket may be fitted to the board to enhance this mode of operation.

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on he board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable 'mother board' which carries the extension ROM sockets and a small 'base board' on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have an B32 or B20, a small adaptor module (the Aries B-12C) is available at a nominal cost. The 6264 static RAM chips used to provide the sideways RAM are advertised elsewhere in our advert.

Price:
Aries B-12 **£40.** Aries B-12C **£5**

THE ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

Aries B-488 Unit: **£238** (Carr £3)

THE ARIES RANGE HARDWARE REQUIREMENTS

Aries B-32 – BBC B, MOS 1.20, hardware plugs into CPU socket.
Aries B-12 – BBC B, MOS 1.20, hardware plugs into all four sideways ROM sockets and connects to the B32 or the B20. The adaptor Aries B-12C module is necessary where these are not fitted.
Aries B-488 BBC B, MOS 1.20, Hardware plugs into 1MHz Bus.



CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234/33383

النور

ARABIC ROM
for the BBC Micro

The ALNOOR ARABIC ROM converts your BBC into a bilingual computer. New keytops provide both English and Arabic symbols. Two sets of Arabic symbols are provided for use in either context sensitive or insensitive operation.

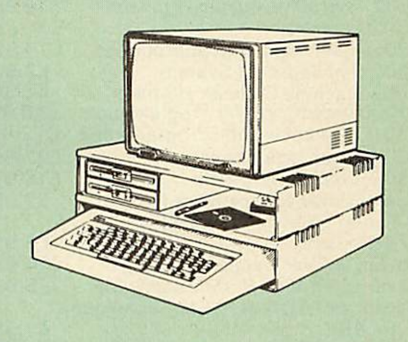
20, 40 and 80 column operation. Compatible with ASMO (449). English/Arabic printer interface software. Numeric entry from either left or right of number. Communications software to send or receive 7 or 8 bit data.

Different shapes of Vowels (e.g. Shadda, Fatha, etc). Different shapes of Hamza. Full English and Arabic character sets with all special characters.

£85

(Price includes Alnoor ROM, Operating Manuals & a full set of Arabic/English Keytops)

PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£20** (carr. £2.00)
PRINTER PLINTH	**£10** (carr. £1.50)
SINGLE MASTER PLINTH	**£14** (carr £1.50)
DOUBLE MASTER PLINTH	**£25** (carr £2.00)

OFFICE MATE

The popular Database, Spreadsheet, Beebplot and Wordprocessor on Disc
£10

OFFICE MASTER

The popular Cashbook, Final Accounts, Mailist, Easiledger, INvoice & Statements and Stock Control
£21

Money Management

This disc based software allows individual transactions to be stored and retrieved for upto 5 Bank a/c and 5 Loan accounts.

Price: Only **£11**

L.B.O. Rom
Life & Business Organiser

Use LBO to organise your life from today until 1999! It can handle literally hundreds of multi-line messages, as many as you are ever likely to need. Despite the very wide range of facilities offered, this professional program is VERY easy to use and requires absolutely NO knowledge of computers. A vital aid to your everyday life, LBO is GREAT FUN TO USE!

D D D Suite Integrated Software System

-BASE **£12**
-CALC **£12**
-PLOT **£12**
COMBO PACK All 3 together **£26**

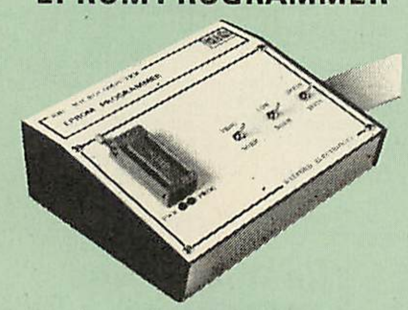
Continued



BOOKS (No VAT on Books)

30 Hour BASIC (BBC Micro)	£7.95
40 Best machine Code Routines	£7.95
6502 Assembly Language Program	£19.95
6502 Application	£11.95
6502 Assembly Lang. Subroutines	£19.95
6502 Development System	£7.50
6502 Machine Code for Humans	£7.95
68000 Assembly Lang. Programming	£19.95
68000 Machine Code Programming	£12.95
68000 Programming the	£22.95
6809, Programming the	£16.95
A User Guide to Wordwise Plus	£9.95
A Young persons Guide to BBC Basic	£5.95
Advanced Disc User Guide	£14.95
Advanced BASIC ROM User Guide	£9.95
Advanced Machine Code Technique for BBC	£7.95
Advanced Programming for BBC	£6.95
Advanced User Guide for BBC	£13.50
Advanced Graphics with BBC	£9.95
Assembly Language Programming on BBC Micro	£11.50
Advanced Programming Techniques for the BBC Micro	£8.95
Adventure into BBC BASIC	£6.95
Applied Assembly Lang. for BBC	£9.95
Assembler Routines for the 6502	£7.95
Assembly Language Programming FOR the BBC Micro	£9.95
Assembly Language Programming on the BBC & Electron	£8.95
Basic Programming on the BBC Micro	£6.95
Basic ROM User Guide	£11.95
Basic User Guide for BBC Micro	£10.00
BBC B+ User Guide	£14.95
BBC BASIC	£5.95
BBC Forth	£7.50
BBC Hardware Projects	£8.95
BBC Machine Code Portfolio	£7.95
BBC Master 128 High Flyer	£10.95
BBC Micro Advanced Ref. Guide	£10.95
BBC Micro Advanced Programming	£9.95
BBC Micro Book BASIC Sound & Graphics	£7.95
BBC Micro ROM Book	£9.95
BBC Micro Disc Companion	£8.95
BBC User Guide	£10.00
BCPL User Guide	£14
Complete FORTH	£6.95
CP/M - 86 User's Guide	£19.95
CP/M Bible	£16.50
CP/M Handbook with MPM	£9.95
CP/M Plus Handbook	£13.95
CP/M Soul of	£16.50
CP/M The software BUS	£8.95
Creative Animation & Graphics	£7.95
Creative graphics on BBC Micro	£7.50
Disc Drive Projects for Micros	£5.45
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SOFTWARE PACKAGE
The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette/disc loading). It is a fully purpose designed and ingegrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:
Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.
Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

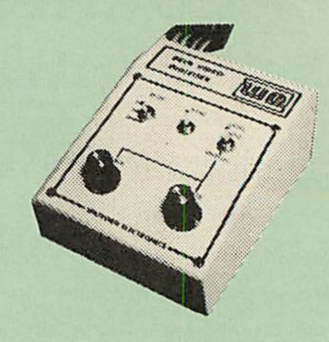
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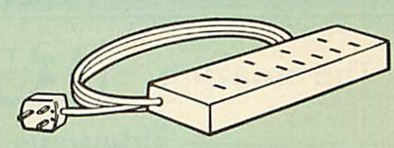
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TECHNO-MATIC DATA
Holdergsgade 19, 1057 KOBENHAVN K, Denmark.

Velobyte, Schiedamzedijk 5a-6a, 3011 EB. Tel: (010) 413 8197/414 5171.

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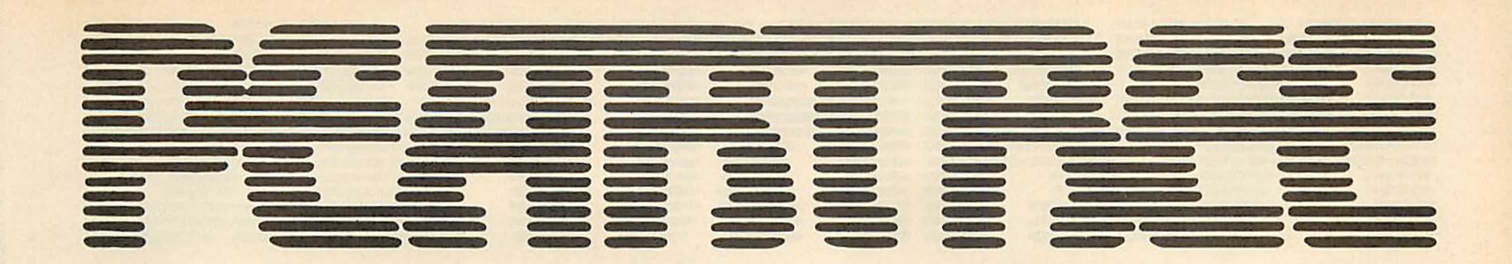
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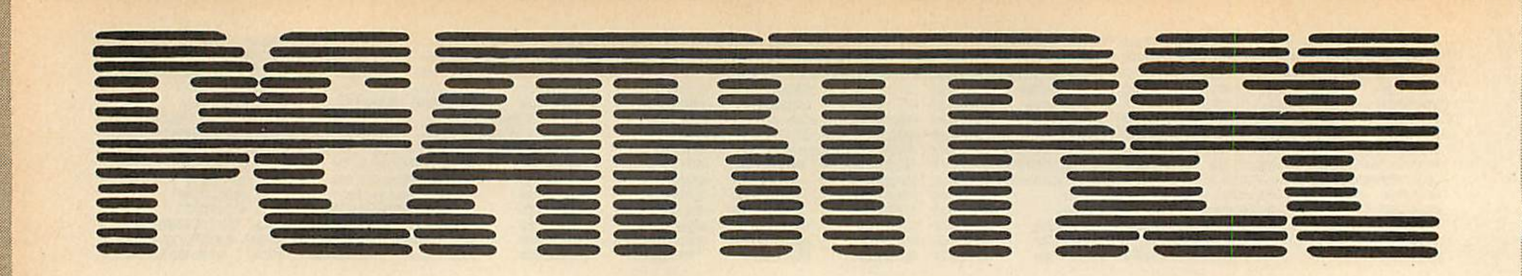
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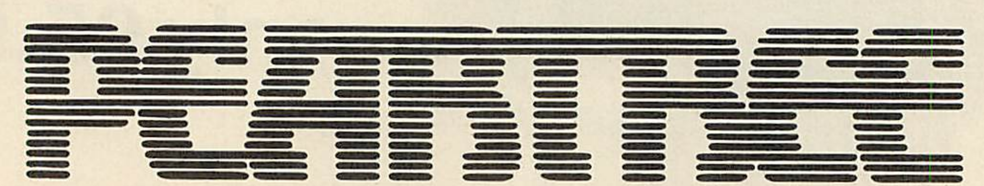
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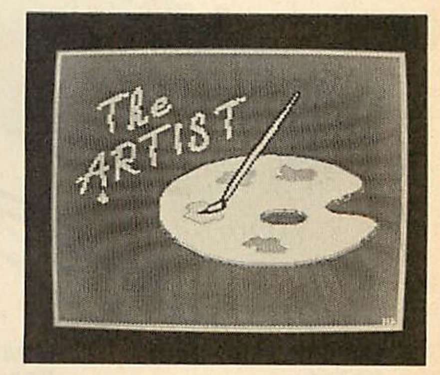
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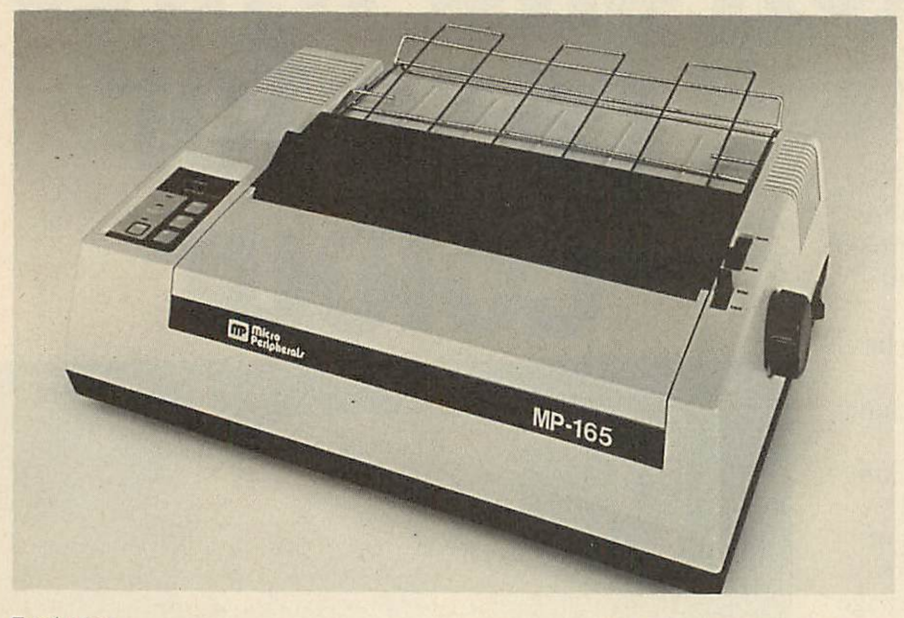
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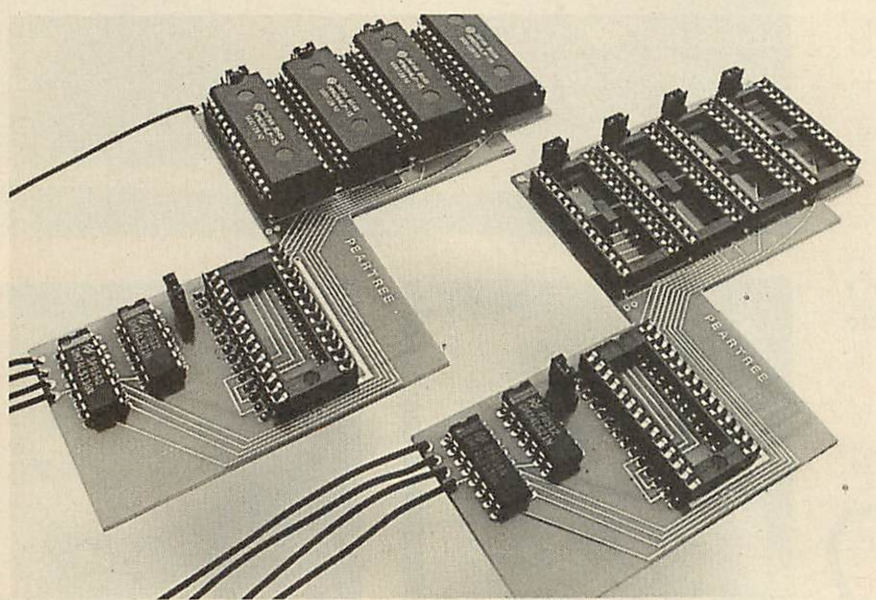


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TURTLE GRAPHICS GROWS UP

Extend the possibilities of the Logo language's popular turtle graphics by using the Master's extra facilities or the Graphics Extension ROM with the BBC micro

Joe Telford

I have a love-hate relationship with the Logo language. Despite its problems it is still one of the few languages which can be usefully applied by beginners and experienced users alike. Complete acceptance of Logo and its consequent improvement await the development of a machine specifically designed to support the Logo philosophy. A half-way house can be seen in the Amstrad 8256 which sensibly 'bundles' Logo as a part of the package – something I've been saying Acorn should do for the last four years.

The facilities which most Logo-users begin with (and few escape from) are the turtle graphics. We may all have investigated the wonderful properties of 'squareness' with an appropriate Logo procedure:

```
TO SQUARE side
  REPEAT 4[FD :side LT 90]
END
```

so that typing SQUARE 200 will draw a square of side 200 turtle units. The approach to graphics using Logo might well be termed 'body geometry' because we can actually stand up, then walk the path of the screen turtle to achieve the same result. So FD 200LT 90 can be replicated by our body and this movement can be repeated four times.

However, ask any primary school teacher about children's mathematical experiences with squares. Certainly many 11-year-olds are only too familiar with the idea of 'squareness'. What then do we do with the 16-year-old computing student who uses Logo? Squares? You appreciate the problem. Logo is about acquiring concepts in probem solving, with either programming as the main *raison d'etre* or another subject (like maths or English). In either case, we must build on the concepts formed in earlier years, rather than repeating them.

The BBC micro's add-on *Graphics Extension ROM (GXR)* which is part of the Master series operating system provides an excellent way of extending turtle graphics activities, and encouraging the development of concepts relating to cartesian (graph) geometry, which is based on X-Y co-ordinates.

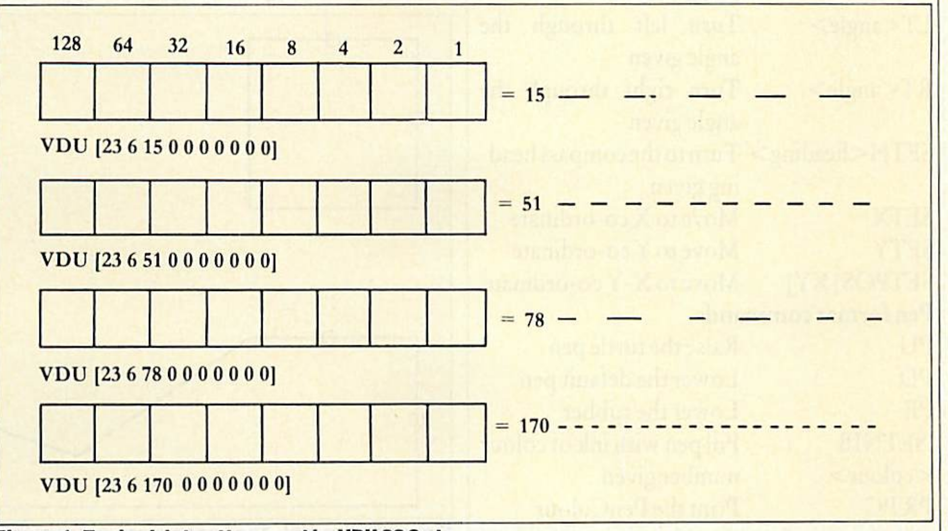


Figure 1. Typical dot patterns set by VDU 23 6 etc

Which Logo?

The Logo commands demonstrated in this article refer to the Logotron version of Logo. You can make the slight amendments necessary to use your own version of Logo simply by using your Logo manual to cross reference commands given here.

If you have a BBC micro or a B+ with the *GXR* then make sure that the *GXR* is selected, before starting Logo. Once Logo is started, it selects mode 4 automatically. If a Master or a B+ is used, get some extra memory by typing:

```
*SHADOW
SETMODE 1
RECYCLE
CS WINDOW
PR NODES
```

This gives more workspace and also four screen colours to work with. Note that SETMODE <128+n> does not work in Logotron Logo.

Most turtles have a field with three different sorts of boundary:

- WRAP, a boundary which reflects turtles
- FENCE, a boundary which stops turtles
- WINDOW, a fence which has been knocked down.

When using Logo with the extended graphics facilities of the BBC system it is easiest to select WINDOW, as the other fencing commands can cause problems.

The simple process of FD 200 involves a number of actions by the Logo interpreter. First the turtle is redrawn in an inverted colour plot to make it vanish. Next the end point of FD 200 is calculated and a line is drawn to that point in the current pen colour. Next the turtle is redrawn in an inverted colour plot so that it re-appears at the end of the line.

Later, we will find some instances where redrawing the turtle causes some of the extended graphics effects to be switched off.

The other movement involves turning the turtle: LT 45 involves further actions by the Logo interpreter. The turtle must be inverse-plotted to blank it out, the new direction must be calculated and stored as a system variable,

and finally the turtle must be re-drawn to indicate the new direction of travel. Again these plottings can affect some of the extended graphics effects.

There are a number of commands which we will need to be aware of when extending the turtle's drawing facilities.

Reset commands

HOME	Move to centre of field (drawing if PD)
CS	HOME turtle. Clear field. Set default PD and ST

Movement commands

FD<distance>	Go forward the distance given
BK<distance>	Go backward the distance given
LT<angle>	Turn left through the angle given
RT<angle>	Turn right through the angle given
SETH<heading>	Turn to the compass heading given
SETX	Move to X co-ordinate
SETY	Move to Y co-ordinate
SETPOS [XY]	Move to X-Y co-ordinate

Pen format commands

PU	Raise the turtle pen
PD	Lower the default pen
PE	Lower the rubber
.SETNIB <colour>	Fill pen with ink of colour number given
PR PC	Print the PenColour

Other general commands

ST	Show the turtle
HT	Hide the turtle
VDU [a b c. . . n]	Perform BBC VDU command

When CS or PU PD are typed the turtle drops its default pen onto the screen. This uses ink from the SETPC command, and when it moves it draws a continuous straight line. Its nib type is .SETNIB 5, but this is set whenever the default pen is dropped. Dropping it is the easiest way to reset the pen from any extended graphics nib.

Nibs for the pen

Logo has a concept of altering the 'style' of the turtle's imaginary pen nib, to achieve different graphics effects. This is explained in the Logo manual, but only refers to two specific nibs. The command which changes the pen-nib is .SETNIB <type> where type is a specific number between 0 and 255. Explorations in the Telford Towers Logo-Lab indicate that maximum success can be achieved by starting with .SETNIB 5 (the default nib) then increasing the nib in multiples of eight, ie, .SETNIB 13, .SETNIB 21, .SETNIB 29, etc. However, even then we need to understand how each pen type relates to the BBC graphics environment. .SETNIB <type> actually sets a system variable in Logo which corresponds to the first parameter of the Basic keyword PLOT so that .SETNIB 5 corresponds to type=5, while .SETNIB 5 FD 100 actually activates the PLOT COMMAND:

PLOT type, 0,100 (for example)

Armed with this information, we can see how to set up Logo to draw with the special-effects nibs provided by the *GXR* or available on the Master.

Begin with a simple nib, available on the standard BBC micro. Type:

CS .SETNIB 21 FD 200

This compound command draws a dotted line with the following dot pattern: dot space dot space dot space.

This is perfectly satisfactory, but the extended graphics commands allow us to control the dot pattern more precisely. To do this we need to use a VDU command:

VDU [23 6]

followed by the value to set the dot pattern over the first eight pixels. This must be followed by seven 0's to complete the VDU 23 command. Look at figure 1 to see the effect of different values for the dotted line. Notice that the range of the value is from 0 (no line) to 255 (continuous line). Useful values include 1,15,51,78 and 170, though you should always experiment with others.

To set any of these values in Logo simply type the following:

VDU [23 6 15 0 0 0 0 0 0 0]

Of course such a command is not immediately meaningful, and hence we should really define a Logo word to perform the task:

```
TO DOTS: value
  VDU (SE[23 6] :value [0 0 0 0 0 0 0])
  .SETNIB 21
END
```

The complexity of the VDU line is caused because Logo VDU commands are required as lists rather than numbers. The sentence primitive (SE . . .) combines a set of two or more lists to form a large list in which each element is decoded, so :value will actually be a real number inside the list. Try typing:

```
CS DOTS 15 FD 200
LT 90 DOTS 51 FD 200
LT 90 DOTS 78 FD 200
LT 90 DOTS 170 FD 200
```

If we save the DOTS tool, then quite young children can make use of dotted lines, because they are protected from the confusion of the VDU commands. Before leaving the dotted lines, try altering the pen colour:

```
CS DOTS 15 FD 200
SETPC 2 LT 90 DOTS 51 FD 200
SETPC 3 LT 90 DOTS 78 FD 200
SETPC 2 LT 90 DOTS 170 FD 200
```

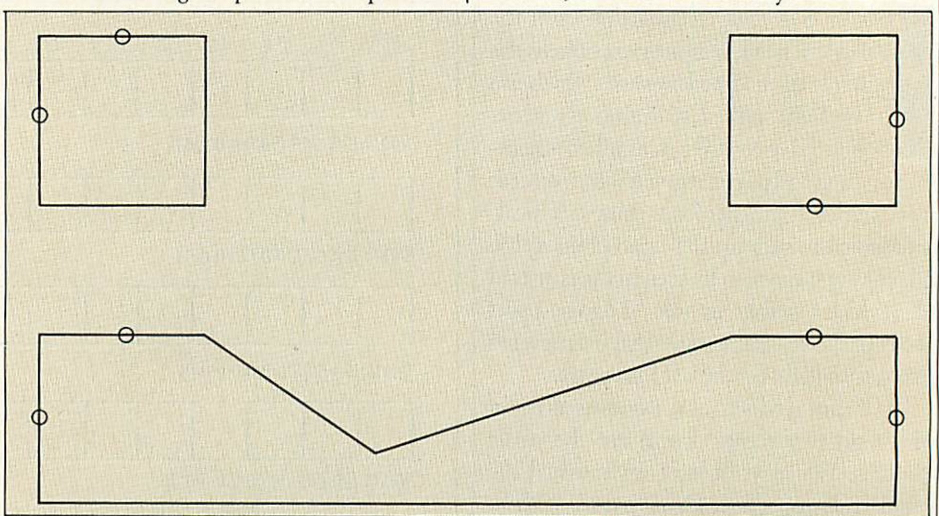


Figure 2(a) and (b). The two squares we want to draw, followed by what is actually drawn

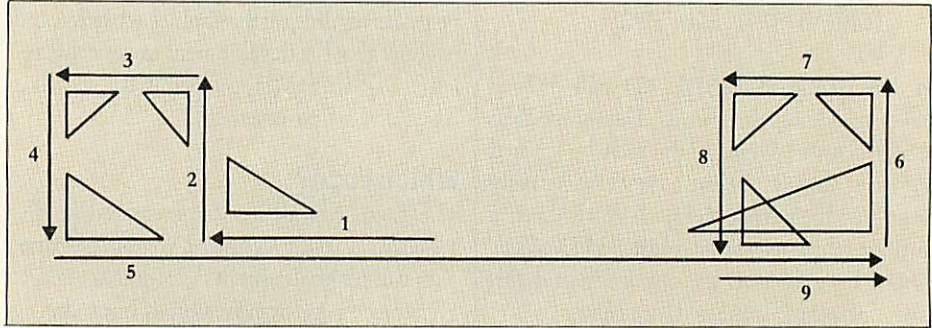


Figure 2(c). How the triangle drawing works

Also consider how mixed colour lines can be achieved. One way is:

CS FD 200 HOME
SETPC 2 DOTS 15 FD 200

but there are others.

We are already moving towards forming a set of rules for using Logo with the extension graphics facilities of the BBC system. The first rule should be if in doubt – move about. In other words only lower the pen and set a particular nib if we want something to happen. General moves and homes for example are safest done with PU.

There are two nibs which fill horizontal lines, and which can be used on the BBC micro to form a crude 'PAINT' facility. Try typing:

CS .SETNIB 77
REPEAT 50 [FD 4]

which gives a full line fill right and left until it encounters a line in a foreground colour, while

HOME SETPC 3 .SETNIB 94
REPEAT 50 [FD 4]

gives a line fill only to the right and until a background colour is reached. Users without Masters or *GXR* can use this facility to paint in shapes like circles:

CS SETPC 1 RT 90 REPEAT 36 [FD 20 LT 10]
HOME SETPC 2 .SETNIB 77 REPEAT 56 [FD 4]
PU HOME

Still with the standard BBC micro, there is a facility to fill in triangular shapes. This is done by typing:

CS .SETNIB 85
FD 200 LT 90 FD 200

The triangle only appears when the second point is reached. This can be extended to squares by typing:

```
TO FILLSQUARE :size
  .SETNIB 85
  REPEAT 4 [FD :size LT 90]
END
```

Then CS FILLSQUARE 200 will fill an appropriate sized square. However, suppose we want to draw the two squares of figure 2a. The procedure would seem to be:

CS PU LT 90 FD 400 RT 90
FILLSQUARE :200
PU RT 90 FD 800 LT 90
FILLSQUARE :200
PU HOME

but the result, shown in figure 2b, is not what we want.

The reason we get such a confused picture is because of the way in which the BBC micro series handles the .SETNIB commands passed from Logo. It would be logical to think that because every triangle needs three corners or X-Y co-ordinates, then the turtle start point would be one co-ordinate; the first corner of the triangle would be the second and the eventual turtle position would be the third.

This seems great except for the way that the Beeb interprets triangle plotting. So if we turn triangle plotting on with .SETNIB 85, then the last two turtle positions are re-read to form a triangle, which may not be the triangle we want to draw. Even worse, as we move, these last two positions are updated so that the turtle always draws a triangular trail.

Look at figure 2c and trace the order of triangle drawing.

The cure for this problem is to move between shapes filled with triangles by using PU and then running on the spot for two paces before .SETNIB 85 is used. Try out the following alternative:

Command	Facility
.SETNIB 5	Draw continuous line[1]
.SETNIB 21	Draw dotted line[1]
.SETNIB 69	Plot end point of line[2]
.SETNIB 77	Fill line right/left to non-background[1]
.SETNIB 85	Fill triangle[3]
.SETNIB 93	Fill line right to background[1]
.SETNIB 101	Fill rectangle[4]
.SETNIB 109	Fill line right/left to foreground[4]
.SETNIB 117	Fill parallelogram[5]
.SETNIB 125	Fill line right to non-foreground[4]
.SETNIB 133	Flood fill to non-background[4]
.SETNIB 141	Flood fill to non-foreground[4]
.SETNIB 149	Draw circle outline[6]
.SETNIB 157	Fill circle[6]
.SETNIB 165	Fill circular arc[4]
.SETNIB 173	Fill circular segment[4]
.SETNIB 181	Fill circular sector[4]
.SETNIB 189	Move rectangular area[4]
.SETNIB 191	Copy rectangular area[4]
.SETNIB 197	Draw ellipse outline[4]
.SETNIB 205	Fill ellipse[4]

Notes: [1]*Common to all BBC series, uses one previous co-ordinate;* [2]*Common to all BBC series, uses no previous co-ordinates;* [3]*Common to all BBC series, uses two previous co-ordinates;* [4]*Extended graphics set, no uses previous co-ordinates;* [5]*Extended graphics set, uses two previous co-ordinates;* [6]*Extended graphics set, uses one previous co-ordinate.*

Table 1: Nib styles available in BBC graphics

CS PU LT 90 FD 400 RT 90
FD 0 FD 0 FILLSQUARE 200
PU RT 90 FD 1000 LT 90
FD 0 FD 0 FILLSQUARE 200
PU HOME

The running on the spot idea can be better conveyed by defining a Logo word:

```
TO SPOT :times
  REPEAT :times [FD 0]
END
```

So FD 0 FD 0 becomes SPOT 2, and we will use this in future because many of the extended commands behave in this same retrospective way.

The extended graphics nibs

These really begin when we start to .SETNIB 101 onwards. The complete range of commands is shown in table 1, but they should be interpreted via this text. All the extended nibs are very powerful, and a good deal of practice is required to use them effectively.

Filling a rectangle is achieved by using, .SETNIB 101. The power of the nib can be shown by trying:

CS LT 45
.SETNIB 101
SETPC 1 REPEAT 4 [FD 100]
SETPC 0 REPEAT 8 [BK 50]
PU HOME

While the diagram of figure 2 can be achieved by:

CS PU LT 90 FD 400 RT 45
.SETNIB 101 FD 280 BK 280
PU LT 45 BK 1000 RT 45
.SETNIB 101 FD 280 BK 280
PU HOME

Remember that the length of a diagonal of a square is roughly 1.4 times the length of the side of the same square. Also remember that the angle of the diagonal to the horizontal decides what sort of rectangle will be drawn. To indulge in rectangle plotting to any great degree will require mastery of graph paper and protractor.

Eventually we will need to make some comparisons between the turtle's field and the cartesian co-ordinate system. This is easiest done on scaled graph paper. Remember that the turtle lives in the centre of the field, and from its home the command FD 100 refers to the position SETPOS [0 100] while LT FD 600 refers to SETPOS [−600 0]. When drawing filled rectangles and many of the other graphics commands, the cartesian system may prove easiest to follow. For example to draw a rectangle 200 high by 300 long to the left of HOME try typing:

CS .SETNIB 101 SETPOS [−300 200] PU

.SETNIB 109 allows a horizontal line to be filled left and right of the turtle position. It is similar to .SETNIB 77, except that it will fill *over* colours until it reaches a left or right boundary line of the same colour as the current SETPC.

.SETNIB 117 allows the filling of parallelograms. A typical example is:

```
TO FLOWER :size :petals
  MAKE "turn 360/petals
  MAKE "angl (240/:petals)
  REPEAT :petals [PETAL :size :turn :angl SPOT 2]
END

TO PETAL :size :petals
  .SETNIB 117
```

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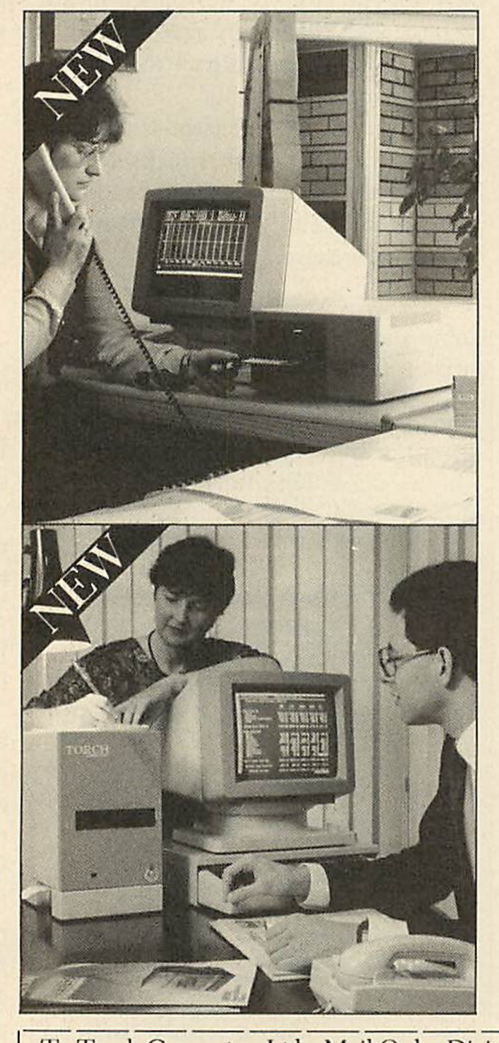
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```
    LT :turn + :angl FD :size
    RT :angl FD :size PU
    BK :size LT :angl
  BK :size RT :angl
  END

  TO SPOT :times
    REPEAT :times [FD 0]
  END
```

Notice that running on the spot is required to prevent confusion of the parallelograms.

There are two extended graphics commands which support flood filling. The first is .SETNIB 133 which sets the nib to flood fill an area bounded by a non-background colour. The second is .SETNIB 141 which flood fills across all colours until a boundary of the current pen colour is reached. For outlined fills use the former, and for full fills without outline use the latter. A suitable Logo word might be PAINT:

```
  TO PAINT
    HT .SETNIB 133
    FD 0 ST
  END
```

We will have to return to the flood fill later, when we start colour mixing.

Fast circles

.SETNIB 149 sets the circle outlining nib. A typical command sequence might be:

```
  CS .SETNIB 149 FD 200
```

which draws a circle, whose centre is the home point, and whose radius is 200. Try:

```
  CS .SETNIB 149 REPEAT 7 [FD 50]
```

You will see that 14 circles are generated because the circle nib behaves like the triangle, parallelogram and rectangle nibs. It uses X, Y co-ordinates retrospectively. The cure is of course to run on the spot. Try:

```
  CS
  REPEAT 3 [.SETNIB 149 FD 50 PU FD 50
  SPOT 1]
```

We can try all the above with the circle filling nib of .SETNIB 157. Circle drawing becomes confused if we try to leave the turtle field with WRAP in action. The best answer is to use WINDOW whenever possible and remember that PU HOME will always return us to home without problems.

.SETNIB 165 sets a nib which draws the centre point of a circle and then interprets the next two moves to draw an arc. Look at figure 3a, which is the sequence of events for drawing a 1/6th circle arc using the commands:

```
  CS FD 300 LT 120 FD 300
```

The home base is used as the circle centre. The first FD command sets the radius of the circle. The final two commands move the turtle to another point on the circumference of the circle and the arc between these last two points is drawn. A semicircle could be drawn with the following command:

```
  CS FD 300 BK 600
```

.SETNIB 173 is shown in figure 3b and it fills the area between the arc and its chord, operating in the same way as above. .SETNIB 181 behaves similarly, except that it fills the complete sector, as shown in figure 3c.

All the arcing nibs behave like the triangle nibs. If problems occur, try PU then move to the centre of the circle, and then run on the spot once or twice. This should remove any tendency for arcs to occur over the screen.

The turtle can copy and move its field – these facilities are some of the most complex available to the turtle. They both work in the way outlined below, except that .SETNIB 189 copies a rectangle and .SETNIB 191 cuts the rectangle out and moves it. Look at figure 4. The turtle must move to three points to copy or move a rectangle.

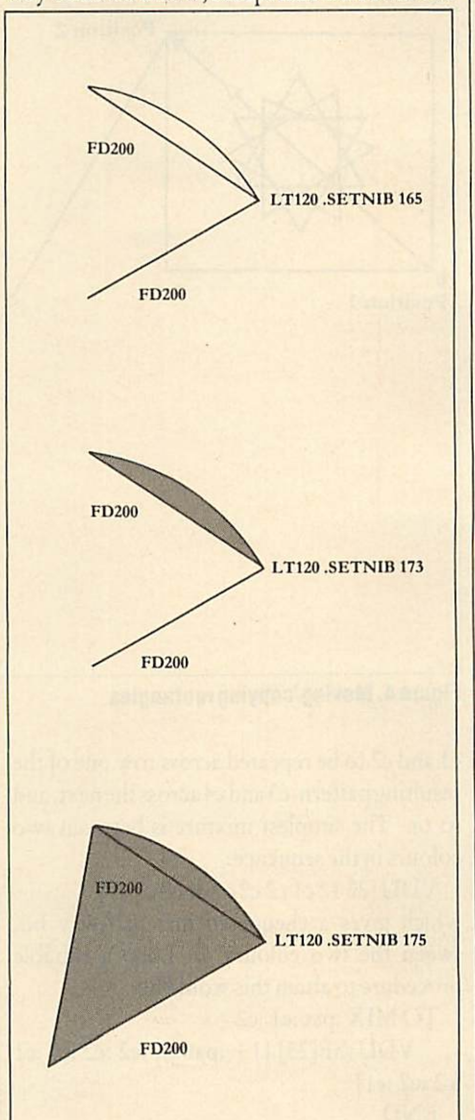


Figure 3(a). Drawing an arc; (b) Filling a segment; (c) Filling a sector

1. The bottom left corner of the area to be copied.
2. The top right corner of the area to be copied.
3. The bottom left corner of the recipient area.

Let's set a problem to explain this in more detail. Imagine that you wish to copy a complex shape from one side of the screen to the other – the shape is shown in figure 4 – and is drawn using the procedure POLY

```
  TO POLY
    CS PU LT 90 FD 300 RT 90
    PD REPEAT 50 [FD 300 LT 145]
    PU HOME
  END

  TO COPY
    LT 90 FD 500
    RT 135 FD 450
    .SETNIB 191 SETPOS [0 −300] PU
  END
```

POLY draws the shape and COPY copies it. The copy procedure must of course be matched to the location of the POLY shape. Inside the COPY procedure the commands behave as follows:

- LT 90 FD 500 moves to start of copy area.
- RT 135 FD 450 moves to other diagonal to record the copy.
- .SETNIB 191 sets the copying nib.
- SETPOS [0 −300] moves to the recipient area with the copy.
- PU protects the screen from more copies.

Simply by altering the .SETNIB 191 to 189 the area is moved rather than copied.

Of all the nibs available to the Logo user, nibs 197 and 205 may need most experimentation. The sequence of actions in drawing an ellipse is:

1. PU and move to the centre of the ellipse.
2. PU and move horizontally to the left-hand edge of the ellipse.
3. .SETNIB 197 and move either by SETPOS or LT/RT/FD to the X-Y co-ordinate of the highest point of the ellipse.

Typical ellipses might be:

```
  CS LT FD 200 .SETNIB 197 SETPOS [200
  200]
  CS LT 90 FD 200 .SETNIB 197 SETPOS [0
  200]
  CS LT 90 FD 200 .SETNIB 197 SETPOS
  [−400 200]
```

The horizontal line in each case is deliberate but it can be removed by including a PU after the CS in each line. The ellipses can be filled simply by replacing the .SETNIB 197 with .SETNIB 205.

It is quite feasible to alter the palette of colours in any Logo mode, on any of the BBC series machines. The key is in the VDU 19 command. In mode 1, we have four logical colours 0 (black), 1 (red), 2 (yellow) and 3

(white), but we can perform a better mix of colours with black, red, green and blue. This means exchanging two colours. To do this type:

```
VDU[1922000000]
```
and
```
VDU[1936000000]
```
We could, of course, make a tool to do this task:

```
TO SETPAL :logical :actual
  VDU (SE [19] :logical :actual [000000])
END
```
This enables us to type:
```
SETPAL 2 2
```
or
```
SETPAL 3 6
```
Which brings us to the simplest of the colour mixing facilities open to the Logo user with a *GXR* or Master. The VDU 23 command allows a number of colour-fill patterns to be mixed. We will concentrate on the four simple mixes, while the more complex ones will be covered in a later article. The VDU commands which control simple colour mixing are VDU [23 11 . . .] and VDU [23 (12/13/14/15) . . .]

VDU [23 11 000000] resets the four simple mixes to their default values. For mode 1 these are: mix 1 red-orange; mix 2 orange; mix 3 yellow-orange; mix 4 cream.

The actual mixing can be done using the next VDU commands. Mix 1 is created by issuing the command VDU [23 12 c1 c2 c3 c4 c5 c6 c7 c8] where the values of c1 to c8 are logical colours available. The approach is for c1 and c2 to be repeated across row one of the resulting pattern, c3 and c4 across the next, and so on. The simplest mixture is between two colours in the sequence:

```
VDU [23 12 c1 c2 c2 c1 c1 c2 c2 c1]
```
which gives a chequered mix half-way between the two colours. In Logo a suitable procedure to attain this would be:

```
TO MIX :pat :c1 :c2
  VDU (SE[23] 11+ :pat :c1 :c2 :c2 :c1 :c1
:c2 :c2 :c1]
END
```
Calling the colour mix is the most difficult part because Logo normally refers to the colour set in the turtle pen.

In fact we need to simulate the Basic GCOL command, and we do this with a procedure.

```
TO GCOL :mode :col
  VDU (SE[18] :mode :col)
END
```
To call the colour mixes 1 to 4 we simply type the following:

```
Mix 1 GCOL 16 0 Mix 2 GCOL 32 0
Mix 3 GCOL 48 0 Mix 4 GCOL 64 0
```
Of course, the GCOL command can do all the other GCOL things, and so is quite useful. Unfortunately just the sight of the turtle can turn off the mixtures because in being plotted on the screen, the turtle changes the value set by GCOL.

The way around this is to always use HT GCOL ... and only ST at the point where you have finished using the colour mix. Look at this procedure to mix purple and fill a square:

```
TO P.SQUARE    define a square
  SETPAL 2 4   change yellow to blue
  MIX 4 1 2    mix purple from red and
               blue (call it mix 4)
  LT 45        point along the diagonal
  .SETNIB 101  use the square nib
  HT GCOL 64 0 hide turtle and use purple
               ink
  FD 280       do it:
  END          end definition
```
I'll conclude with a set of procedures for drawing a typical picture in modes 1 or 129. Rather than the usual four available colours, this picture mixes 11 different shades on the screen at once. The procedures show a mixture of .SETNIBS and mixes so that the items which we have discussed are demonstrated.

Provided we accept that the body geometry approach to Logo has much going for it, and we don't try to push children past that state too quickly, then the extended graphics facilities of the new range of BBC series micros can really supercharge our turtles.

Turn to the index to yellow pages on page 113 for details of where to find Joe's listings.

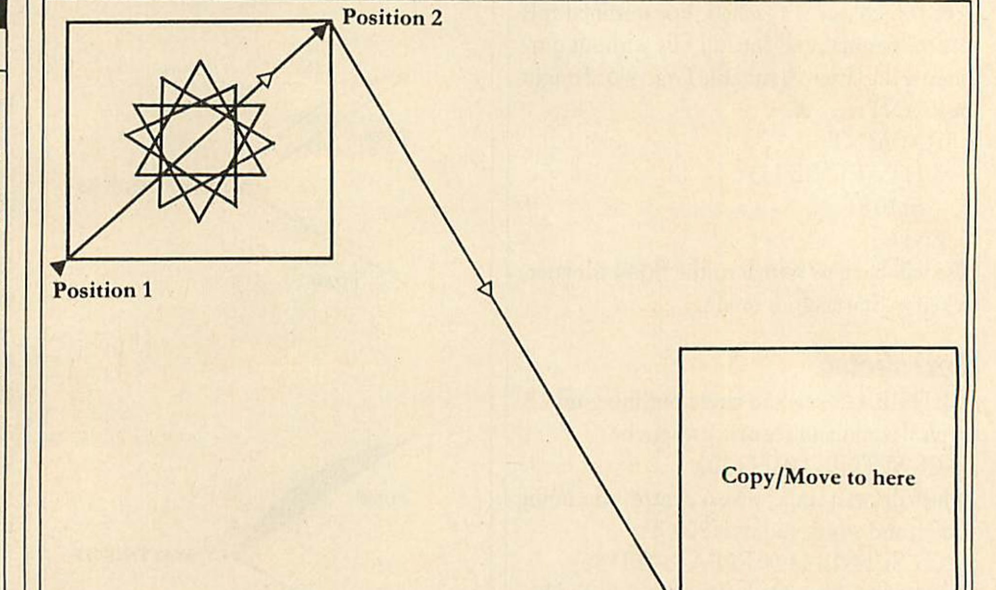
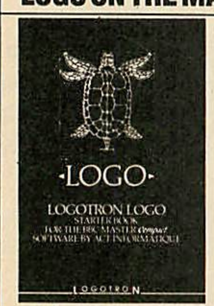


Figure 4. Moving/copying rectangles

LOGO ON THE MASTER COMPACT



Joe Telford's crystal ball was well-polished when he wrote this article. Acorn has bundled the Logotron version of the Logo language with the new Master Compact.

The language comes on a 3.5in disc ready to run in the standard disc drive supplied with the Compact.

The software is loaded into the 'sideways RAM' part of memory where it can be treated as if it were an actual ROM chip inside the machine.

Logotron's standard manual is supplied with the Compact, which details the commands in the language and gives sample listings for you to try.

Joe Telford wrote a wordprocessor with Logotron Logo in the January issue this year (page 77). His review of three versions of Logo for the BBC micro, including Logotron, was carried in the May 1985 issue (page 65).

Other articles of interest include a turtle graphics program in the February 1985 issue by Malcolm Banthorpe (page 158). This issue is sold out but photocopies of the eight pages cost £1.60 from Redwood Publishing at 141-143 Drury Lane, London WC2B 5TF (includes UK postage and packing, add £1 overseas).

In June, Joe Telford covered the Advanced Disc Filing System which is standard on the Master and the new Compact. This controls the way files are stored on disc. In February he looked at sideways RAM.

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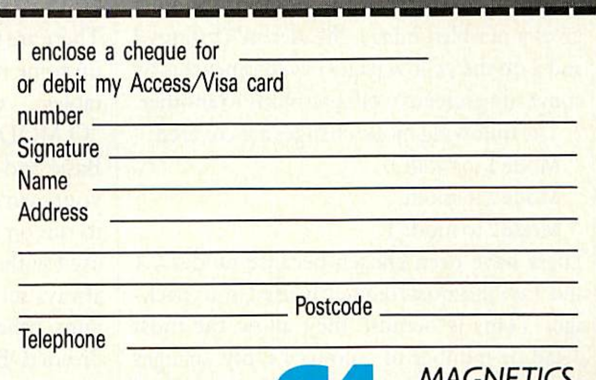


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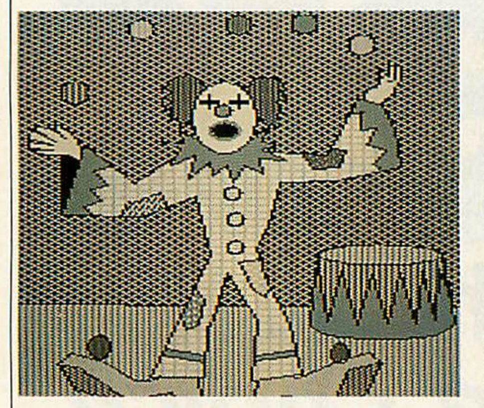
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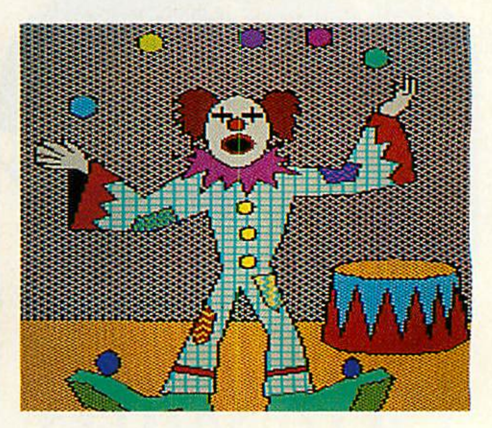
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ART TO ART CONVERSION

Transfer screens drawn with one art package to another – even if they use different modes – with this software to convert screens between modes 0, 1 and 2



Phil Wilkes

There are many art and graphics programs available for the Acorn range of micros, each offering slightly different facilities. It is often helpful to use more than one to get the effects you require. Transferring a screen from one program to another is usually done by saving the screen from the first program and loading it into the second. This can be done because most art packages store pictures by simply saving that part of the micro's memory dedicated to the screen.

This technique cannot be used if the programs operate in different screen modes. Loading a picture created in one mode into another gives a jumbled image. 'Modecon' (listings 1 and 2 on the yellow pages) overcomes this by converting screens from one mode to another.

The following mode changes are covered:

Mode 1 to mode 0
Mode 2 to mode 0
Mode 2 to mode 1

These have been chosen because modes 0,1 and 2 are the most frequently used in art packages. (This is because they allow the most detail or number of colours.) Only changes from lower to higher resolutions are included – moving the other way would mean losing considerable detail from the screen. In carrying out these mode changes, although the resolution increases, the number of colours available always decreases. This can be compensated for by using the increased resolution to give different shading patterns to represent colours in the same way as a dot matrix printer dumping a colour graphics screen. In fact, changes to mode 0 can be used to check how a screen will look when printed in black and white, but very much faster than actually printing it out (and without wasting precious paper). The routines work on any type of graphics screen but are particularly effective when used with digitised pictures.

How to use the programs

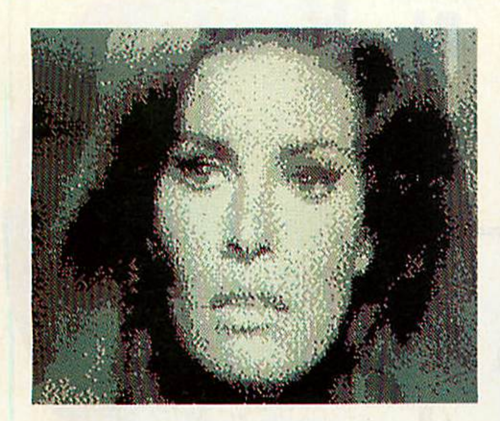
There are two listings to type in. Listing 1 sets up some machine code and some conversion tables which are then saved as "O.MODECON". Listing 2 is written in Basic and uses the saved routine to convert your own screens. The programs were written to run on a disc based machine. They can be used with tape, but make sure that PAGE is always set to &1900 when running the programs, otherwise you could be faced with the dreaded 'Bad program' message. (Do this by typing in PAGE=&1900 before you start.)

To use the programs, type in listing 1 and save it (this is always essential when dealing with machine code as an error could mean your program gets overwritten and you would have to type it in again). Notice that the routines for each mode conversion are independent, yet have many lines in common. Once the first is typed in, using the cursor and copy keys for common sections of code will save a lot of time.

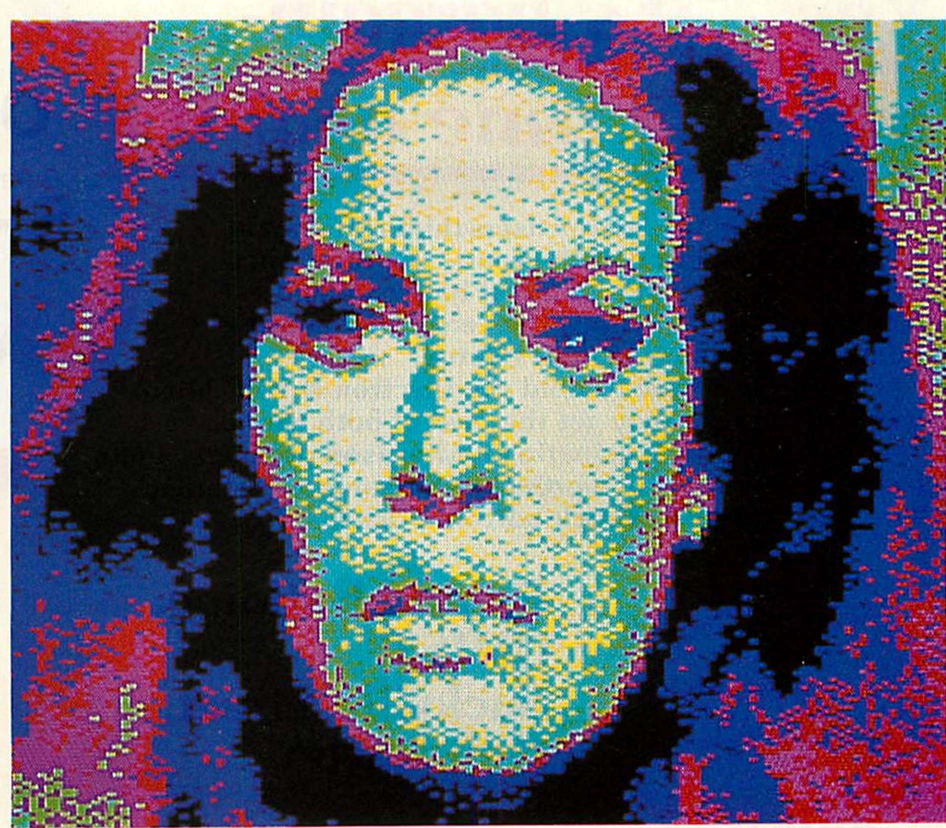
When listing 1 is run, the conversion tables are compiled, the machine code assembled and the section of memory from &1500 to &18FF containing both is saved as "O.MODECON". The program gives a suitable output to keep you informed of progress but requires no input from the user. This program should only need to be run once.

Listing 2 loads "O.MODECON" and provides easy access to the conversion routines. It first sets variables to each of the three machine code entry points. Prompts are then given for the initial mode and screen name (which will have been saved previously from another program), and also for the final mode and screen name.

Don't choose the same name, or the original screen will be overwritten (unless discs are changed while the program is running, that is). I find it useful to include the mode in the file name, eg, P.1PIC will be a mode 1 picture. I also keep pictures in the P directory on discs to avoid confusion with other types of file. This







You can see the same clown screen (opposite page) in (l to r) mode 0, mode 1, and mode 2. The Raquel Welch screen (above) was converted using Phil's software. Clockwise from top l: mode 0, mode 2 and mode 1

file name convention is also used by several art packages.

The screen mode is then set to the final mode and the picture loaded into the screen memory. The picture will be recognisable but will be covered in vertical stripes at this stage. Once the screen has loaded, the appropriate mode conversion routine is called and the screen is changed to the new mode in less than a second. The computer will now beep and wait for any key to be pressed. This allows discs (or tapes) to be changed before finally saving the picture. Once saved, the new screen can be used in any program which used the final mode.

How the programs work

There is no need to understand how the routines work in order to use them. However, for those interested, the remainder of this article gives some of the theory behind them.

The mode conversion routines use the fact that screen memory is arranged in an identical manner for modes 0, 1 and 2. The difference lies in how each byte of screen memory is decoded to give the display (figure 1).

Any one byte can only hold a maximum of 256 different values (0 to 255). If we work out for each value how this appears in one mode, and then how each colour is to be represented in the new mode, we can construct a simple

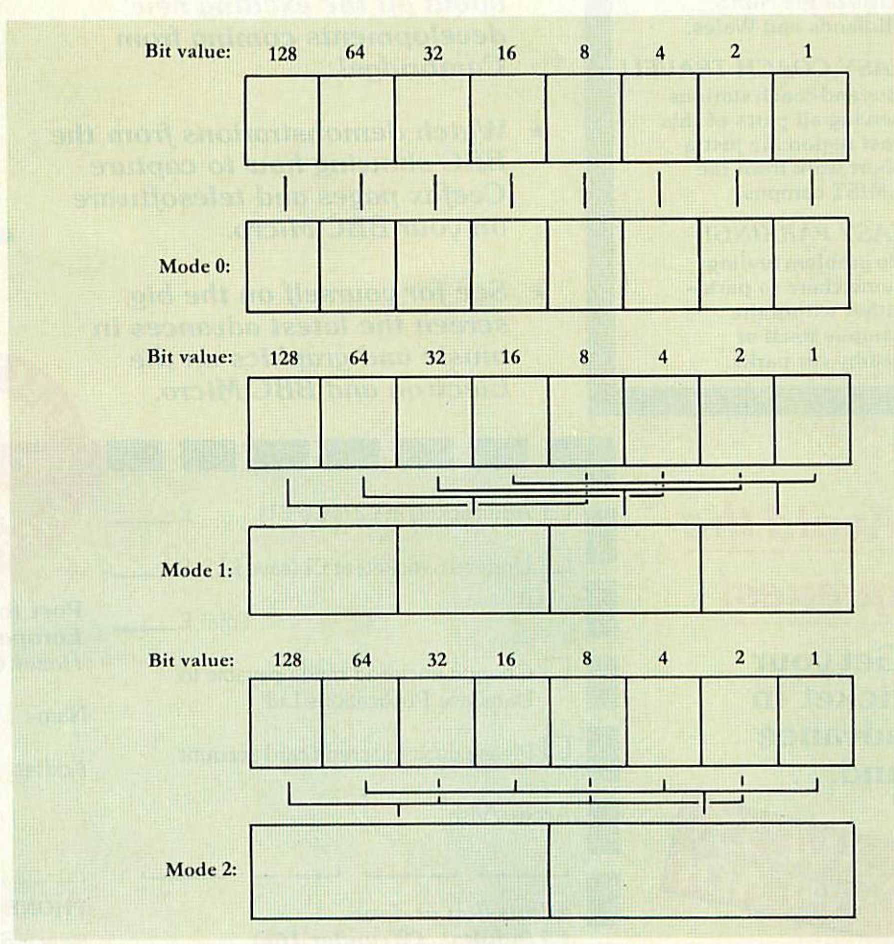
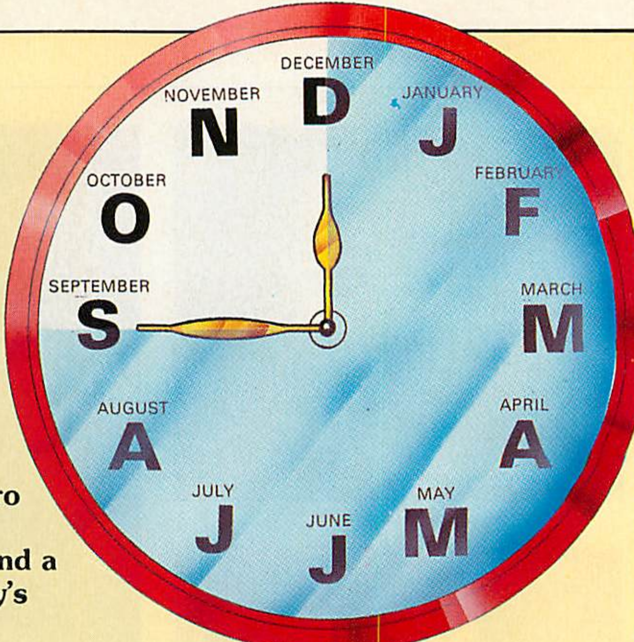


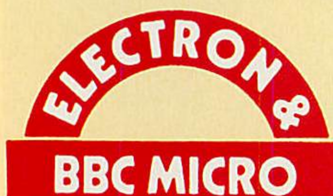
Figure 1. How each byte of screen memory is decoded to give the display in different modes

Yes – it's bargain-hunting time again!



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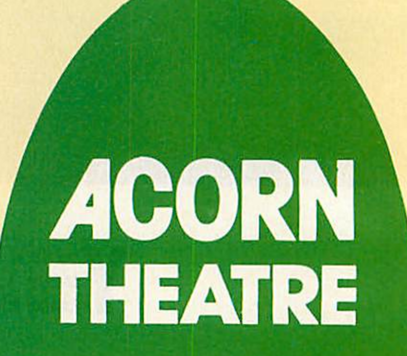
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table for each possible value to perform the mode conversion.

This is precisely what 'Modecon' does. It actually uses two tables for each value which are used alternately to give better dot patterns to represent the colours. As each byte translates into only one byte, the tables are stored as consecutive bytes in memory (a byte array) rather than use integer arrays which would waste memory.

The machine code program simply looks at the value in every byte of screen memory, looks up this value in the byte arrays and replaces the old with the new value.

With conversions from mode 2, flashing colours are treated in exactly the same way as the corresponding steady colour. This means that the top two bits of each byte can be ignored, making each table just 64 bytes in length compared to the full 256 for the mode 1 to mode 0 conversion.

To set up the tables, it is not necessary to consider all 256 (or 64) values individually. We can let the computer do some of the work for us. All we need to do is decide how each colour in the first mode is to be represented in the second mode, and then analyse each byte value to see what this represents in terms of colours on the screen. Each colour is converted to the number necessary to give the chosen pattern in the new mode. The resultant numbers are then combined to give the full conversion value. Examination of the table set-up routines in listing 1 should make this clear.

Figure 2 illustrates the different dot patterns used in each of the conversions. Conversions to mode 0 just reflect the brightness of the colour in the original mode giving a grey scaled picture. Converting from mode 2 to mode 1, I have tried not only to reflect the brightness but to approximate some of the colours as well. This effect is sometimes helped by changing logical colour 2 in mode 1 to cyan using VDU 19,2,6;0;. This is not always helpful – if in doubt, try it and see.

The routines will work as they stand with both shadow screen memory and the 6502 second processor, but with one important difference. As the memory which is being accessed does not now represent the screen (but is parallel to it), you cannot see the changes as they happen. This will not normally be a problem as it will usually be the final coverted screen which is required rather than seeing the routines as they happen. It is always possible to switch off the shadow memory or second processor if you would like to monitor the program's progress – there is no advantage in having the extra memory present. Once a picture has been converted, it can of course be used with any software which can use these

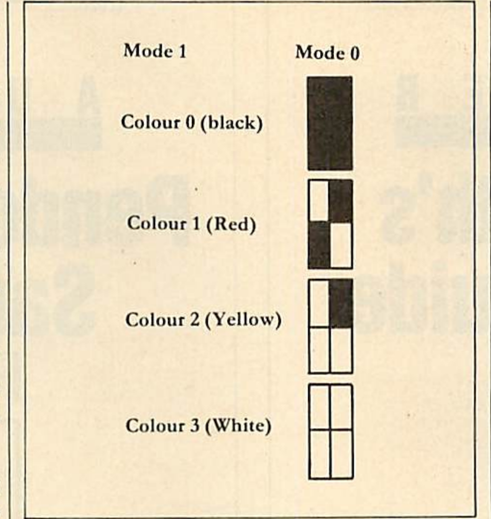


Figure 2(a). Dot patterns converting from mode 1 to mode 0

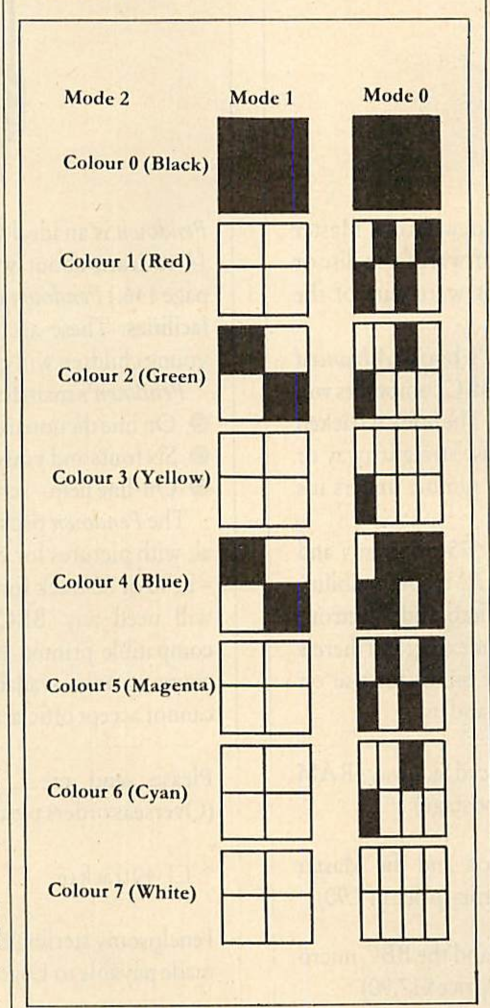


Figure 2(b). Dot patterns converting from mode 2 to modes 1 and 0

extra pieces of hardware.

Alternatively, you may like to amend the program using indirect methods of accessing the screen memory, such as using OSWORD 5 and OSWORD 6 to read and write respectively from the 6502 second processor. The method used for shadow memory will depend on the make of your shadow board and the software support available for it.

As an added extra, I have included an entry point in the code to convert mode 5 to mode 4 (CH54). While this probably isn't as useful as the other routines, the conversion table necessary is identical to the mode 1 to mode 0 conversion and its inclusion required only a few extra bytes. The only change is that the start address is greater to allow for 10k screens rather that 20k.

Converting between screens of differing lengths (eg, from mode 4 to mode 1) requires a slightly different technique and I will cover this in a future article.

ADFS

The mode conversion will run on a Master 128 or Master Compact under ADFS. It will not run as shown on a BBC B/BBC B+ or Electron with Plus 3, all of which raise Page to &1D00 when running ADFS.

The programs can be modified to run so that the machine code programe CONVERT is assembled above this address. Assembling the program at &1500 will make it overwrite the ADFS catalogue and variable/pointer space which will result in the micro hanging up. To ensure this does not happen make the following changes to the two programs:

MODECON

```
65 HIMEM=&2C00
140 even10%=&2D00
150 even20%=&2F00
160 even21%=&2F80
170 odd10%=&2E00
180 odd20%=&2F40
190 odd21%=&2FC0
780 P%=&2C00
1520 FOR i%=&2C00 TO P%-1
1550 IF total%<>14839 PRINT "checksum error in assembler.":VDU7:END
1570 FOR i%=&2D00 TO &2FFF
1640 *SAVE "CONVERT" 2D00 3000
```

DEMO

```
70 MODE 2:HIMEM=&2C00
100 MODE 1:HIMEM=&2C00
140 MODE 0:HIMEM=&2C00
210 ch10%=&2C00
220 ch20%=&2C24
230 ch21%=&2C4C
```

The conversion program now loads in at &2C00, so ensure that any programs you may use in future which utilise CONVERT first set HIMEM to &2C00 to prevent the machine code being corrupted.

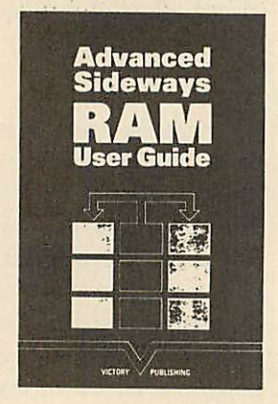
Phil Wilkes used his Artist program, presented in the August issue, to create all these pictures, which are featured on the Acorn User Gallery Disc (see page 111).

Phil Wilkes' listings are on the yellow pages. See the index to yellow pages on page 113.

RAM GUIDE

AU OFFER

Bruce Smith's RAM User Guide



Sideways RAM is a technique central to the new Acorn Master series of computers. It allows you to load in software from disc or cassette which is designed to behave as if it were part of the machine, and is always on tap to the user.

Acorn User Technical Editor Bruce Smith's book, *Advanced Sideways RAM User Guide for the Master* and BBC computers will allow you to exploit Sideways RAM to the full. The book is backed up with tried and tested software for you to use straight away or adapt to your needs (and for those with less nimble fingers it's available on disc).

Some of the features of the book include: 25 programs and routines demonstrating the use of Sideways RAM; compatibility tables and conversion notes for the BBC micro and Electron; writing languages and interpreters; extensive indexing; and there's even a ROM formatter developed by Bruce Smith for use on commercial software, ready for you to type in and use.

Please send me____ copy/copies of the Advanced Sideways RAM User Guidebook by Bruce Smith at £9.95 (inc postage)

Please send me____ copy/copies of the book and the Master software* disc at the special price of £14.95 (normal price £17.90)

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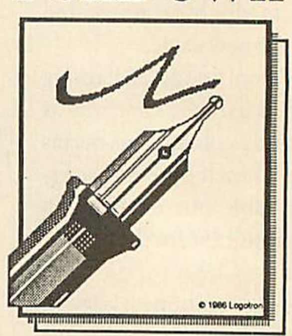
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PENDOWN

AU OFFER

Pendown – £29.95 Save over £9



Pendown is an ideal way for children between the ages of six and 14 to learn about wordprocessing. (See Chris Drage's review, page 146.) *Pendown* uses menus to control all its wordprocessing facilities. These are clearly labelled on the keystrip, and very young children will quickly find their way around them.

Pendown's main features include:

- On line dictionaries including vocabulary and spelling help.
- Six fonts and you can create your own alphabets or icons.
- On-line help – screens to give assistance to writers.

The *Pendown* package includes a specially-designed A4 manual, with pictures for easy reference; two keystrips; a utilities disc – in 40 or 80 track format; and a 16k ROM. To use *Pendown* you will need any BBC micro with disc drive and an Epson-compatible printer. Normally, priced at £39, this generous discount is only available until 31 October 1986. We regret we cannot accept official orders without payment.

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SPIDER POWER

What's spider power? Well, you can plot just about any equation so that you can explore the behaviour of mathematical functions with the Spider curve-plotting program

David Johnson-Davies and David Deutsch

Curve-plotting programs provide an excellent way of exploring the behaviour of mathematical functions, and produce especially spectacular results on computers with high-resolution graphics displays, such as the BBC micro. Several such programs have appeared in *Acorn User*, so why present another?

Simpler curve-plotters have three main drawbacks: first, they cannot plot some of the most interesting equations, such as X^2^Y=Y^2^X, which have X and Y on both sides of the equals sign. Such curves often require more than one Y value to be plotted for each value of X. Second, they do not deal with equations containing expressions such as 1/X or LN(SIN(X)) which cannot be evaluated at certain points. Third, they do not allow functions to be given in polar co-ordinates. The *Spider* curve-plotter overcomes all of these drawbacks. Equations can be expressed in any convenient form, with arbitrary expressions involving X and Y, or the polar co-ordinates r and t, or even mixtures of all four of them, on both sides of the equals sign.

For speed, the program evaluates the function at as few points as possible in the plane. As soon as it has found a branch of the curve, it crawls along the curve, plotting as it goes, like a spider weaving a web – hence its name. Once one branch of the curve has been fully plotted, it searches for and plots any other branches.

The sample plots in figures 1 to 3 give examples of curves plotted by the *Spider* that would cause the three types of problems listed above for other programs.

The curves in figure 1 are plotted from functions that cannot be put into the standard form, 'Y = a single-valued function of X'. Figure 1(a) shows a plot of the curve:

X^2^Y = Y^2^X

Figure 1(b) shows another interesting curve:

Y^2 = X^4–X^6

which has a dumb-bell shape. Finally, figure 1(c) shows how two sine-waves Y = SIN(X) and X = SIN(Y) are superimposed in the function (Y–SIN(X))*(X+SIN(Y))=0

This illustrates a general method of deriving the equation of superimposed curves. The functions plotted in figure 2 are all 'badly behaved' equations. Figure 2(a) shows:

Y = TAN(X)

which becomes infinite when X = PI/2, 3*PI/2, etc. Figure 2(b) gives a plot of:

Y = LN(SIN(X^2))

which cannot be evaluated for values of X where SIN(X^2) is negative.

The third set of plots, in figure 3, shows curves expressed in polar co-ordinates, where each point is specified by its distance r from the origin, and the angle t made by the line joining it to the origin (the program uses t as a shorthand for the more usual Greek letter 'theta'). In polar co-ordinates a spiral can be described very simply by the equation:

r = t

as plotted in figure 3(a). 3(b) shows a spiral with a superimposed ripple, with equation:

r = t + 1–COS(10*t)

Finally, figure 3(c) plots:

r = t+X/2

illustrating that polar co-ordinates can be mixed with cartesian co-ordinates in the same equation. These examples give some idea of the range of functions that can be explored with the *Spider*; some other more complicated functions will be described later.

Functions and curves

A general function of X and Y, Z = FNA(X,Y), describes a surface in three dimensions. For every point (X,Y) on the surface, the function FNA(X,Y) gives the height Z of the surface. The function is said to have a 'zero' whenever the height is zero.

If you think of the surface as a range of mountains partially submerged in water, then the 'zeros' occur where the mountains meet the water. The shape of the water-line (viewed from above) is the curve in two-dimensions given by FNA(X,Y) = 0.

For example, consider the surface whose height at any point (X,Y) is:

Z = 1–X^2–Y^2

This defines a surface like a mountain peak, standing one unit above the water-line. The water-line at Z = 0 describes the curve:

1–X^2–Y^2 = 0

which can be rearranged as the more familiar:

X^2+Y^2 = 1

This is, of course, a circle with a radius of 1 and this is the form in which you would give the function to the *Spider* program.

The program works as follows. The Spider crawls over the surface, using a mathematical technique called 'Newton's method' to locate the water-line. It then crawls along the water-line to plot the curve. If it meets part of the curve that it has already plotted, it jumps to another place on the surface, and starts again looking for another branch of the curve.

The program can optionally plot red dots to show the points on the plane that the Spider is visiting in its search for a branch of the curve. The patterns made by these dots show the behaviour of 'Newton's method' used to locate the curve's branches.

Solving equations

Before describing the full *Spider* program, which solves equations in two variables, we will illustrate how it works by showing how a computer can solve an equation containing just one unknown variable. Solving an equation for X means finding a value of X for which the equation is satisfied. For example:

2*X = X+3

is satisfied for the value X = 3, because 2*3 = 3+3, so X = 3 is the equation's solution.

The first problem is how to allow the user to type in an equation which can be evaluated for different values of X. Solving the equation 'function of X = another function of X' is equivalent to finding a value of X for which: (function of X) – (another function of X) = 0. The solution is to use EVAL on a version of the equation with '=' replaced by '–'. This program reads an equation into g$ and puts a version into f$ which can be used with EVAL:

```
10 INPUT g$
20 E% = INSTR(g$, "=")
30 f$ = "("+LEFT$(g$,E%-1)+") - ("+MID$(g$,E%+1)+")"
40 PRINT f$
```

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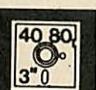
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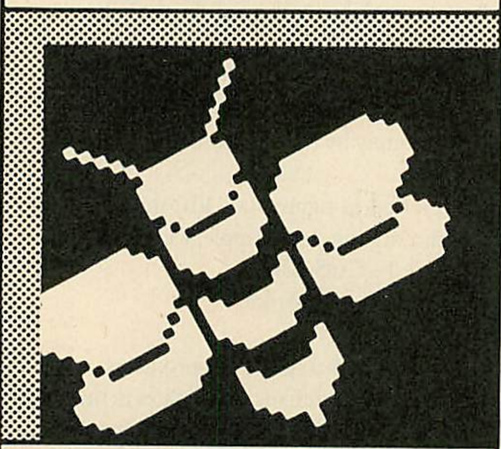


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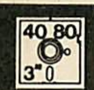
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*LABEL PRINTER
*DISC SORT
*EXTENDED SEARCH
*FREE FORMAT TRANSFER
*FAST PACK
*STATUS

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- Very fast & very flexible

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RAMROD is the ultimate in toolkit ROMs and is fully compatible with the whole BBC range from Model B through to the MASTER 128 and including both 6502 and TURBO co-processors. RAMROD adds 54 new commands to your computer. Areas covered are DISC (DFS & ADFS), GENERAL (memory commands etc.), ROM (including sideways RAM) and TUBE.

RAMROD provides commands to dump memory or a disassembly of memory to a printer. Editors can display the screen in 40 or 80 column mode.

DISC
Edit discs and search for ASCII or HEX sequences.

GENERAL
Edit, search, disassemble, compare, dump to printer and relocate ANY area of memory including the SHADOW screen. List vectors in use, load and save function keys even on MASTER etc.

In addition to the above you can move between ROM/RAM banks using (CTRL) Cursor Keys when in either memory or disassembly mode PLUS you can switch between memory editor and disassembler by pressing (CTRL)(TAB).

ROM
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TUBE
Provides the same memory commands as GENERAL plus SHIFT and COMPARE memory across the TUBE both ways.

We cannot do justice to RAMROD in the space here so please ask us to send you a fuller data sheet - RING NOW!

NEW PRODUCTS
Watch out for a fabulous new product which will be released during SEPTEMBER for the MASTER and its compatibles.

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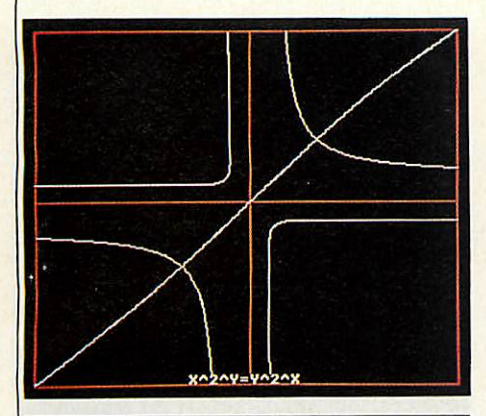
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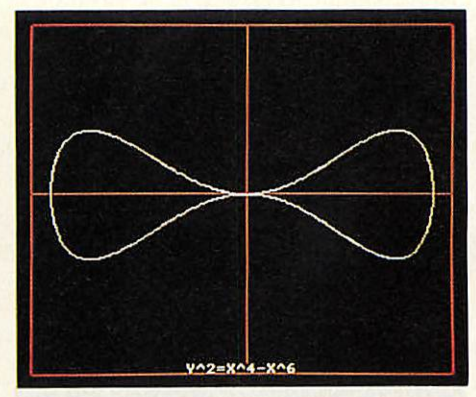


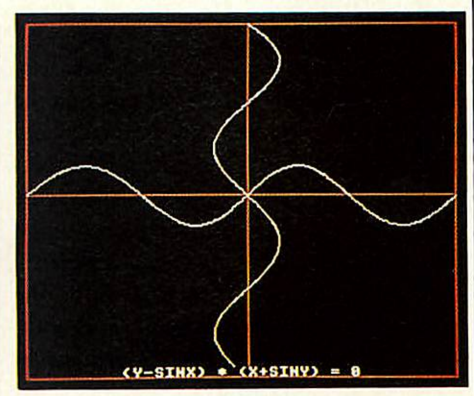
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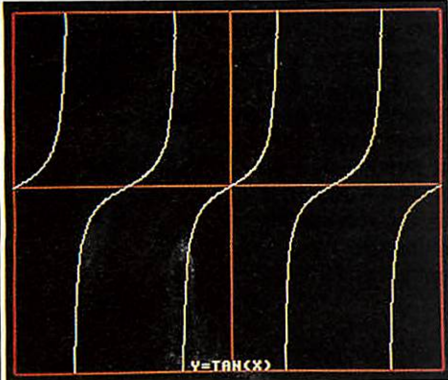


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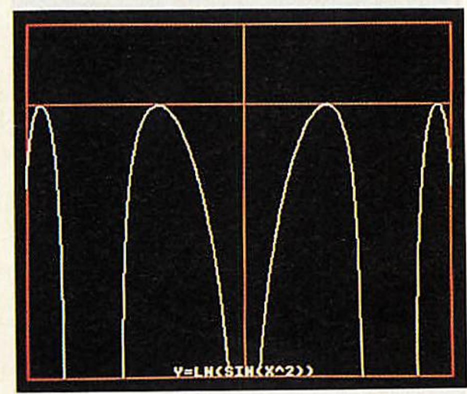
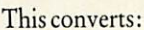


Figure 1. (Top row, left to right) Plots from functions that cannot be put into form 'Y= function of X'.
(a). X^2^Y=Y^2^X.
(b). X^2=X^4−X^6.
(c). Y=SIN(X) and X=SIN(Y) superimposed in (Y−SIN(X))* (X+SIN(Y))=0

Figure 2. (Bottom, left to right).
(a). Y=TAN(X)
(b). Y=LN(SIN(X^2))



This converts:

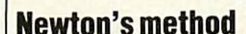
2*X = X+3 into: (2*X)−(X+3)

Incidentally, the extra brackets are inserted to avoid problems with equations such as:

X = 1−X

Now we want to find a value of X such that EVAL(f$) is zero.

Newton's method



Listing 1 on the yellow pages shows a program which uses EVAL to solve an equation which the user types in. The program uses a variant of a method attributed to Sir Isaac Newton (but probably not invented by him). It works by starting with an initial 'estimate', v, of the solution, (which, in most cases, need not be anywhere near an actual solution), and then successively improves it until the desired accuracy is reached.

The function is evaluated at the points where X = v−a and where X = v+a. The curve of the function is then approximated near X = v by a straight line through these two points. Then the value of X where the straight line crosses the X axis is taken as an approximation, often a surprisingly good one, to the value where the function is zero, which is the solution we want.

The value of 'a' is chosen as less than the accuracy we want, called 'accuracy' in the program, for a good reason. For certain functions, such as:

X*X = 0

the line joining two points on each side of the curve actually crosses the X axis further away from the solution (X = 0) than the original two points. We choose these points closer to the solution than the finally desired accuracy to ensure that the program will, for reasonable functions, eventually reach the criterion.

Try it with a few equations. For example, you could try the equation:

X = COS(X)

with the estimated solution X = 1 and 'accuracy' 1E−7. The program prints:

Equation to solve for X: X = COS(X)
Estimated solution: X = 1
Desired accuracy in X = 1E−7
Solution found near X = 0.739085133

The NEWT program uses ON ERROR GOTO to trap errors that might occur during evaluation of the user's equation. Otherwise, when given an equation such as SQR(1−X^2) = 0 which has the perfectly good solution X = 1, the program would fail, because right next to the solution (X = 1 or X = −1) there are values of X which cause an error when the program tries to EVAL the function (SQR(1−X*X))−(0). For example, if X = 1.01, the value of 1−X*X is negative, −0.0201, and the square root of a negative number does not exist. The program would generate an error as soon as one of its successive estimates of the solution X happens to be larger than 1.

Instead of halting when the program encounters an 'error' it can take remedial action, specified by you, and then continue normally. In your program, if EVAL fails for a new estimate of X, the error handler (lines 320-370) is invoked and X is set to a value half-way between the old and the new value, in the hope that the function can be evaluated there. If not, the error handler will be invoked again and X will be set still nearer to the old value.

On the BBC micro, any 'error', even one that is intercepted by ON ERROR GOTO, clears the 'RETURN' stack, so that all subroutine return addresses are lost. This means that if the error occurred inside a procedure (whether called as a PROC or FN or by a GOSUB), the program would fail to return to the calling location when the procedure ended. This is the reason why we have to 'simulate' the subroutine call on line 140 by using a GOTO statement.

Curve drawing

The 'Newton's method' way of solving equations is based on the fact that if f(x) is a function of x, and x = v is an approximate solution of the equation f(x) = 0, then if a is a small number:

$$v - a * \left[\frac{f(v+a)+f(v-a)}{f(v+a)-f(v-a)} \right]$$

is usually a much better approximation to the solution than v was.

Drawing a curve in two dimensions is equivalent to finding all the solutions of an equation in two variables:

f(x,y) = 0

The curve drawing program, *Spider*, shown in listing 2 on the yellow pages, uses a two-variable Newton's method to find any one point on the curve, and then moves along the curve in short straight-line jumps, correcting itself with Newton's method after each jump.

Program operation

The key to the program's operation is the way that it tests for a zero at a given point on the curve. At first sight it might seem sufficient simply to evaluate the function at that point and see if it is less than some very small value such as 1E−7. However, this is not good enough, since the function may get very small without actually passing through zero. The solution is to evaluate the function at an additional four points around the central point:

```
            (x,y+dy)
               ↑
(x−dx,y)←(x,y)→(x+dx,y)
               ↓
            (x,y−dy)
```

A zero has been found if at least one of the five values is on the other side of zero from the others (line 1040).

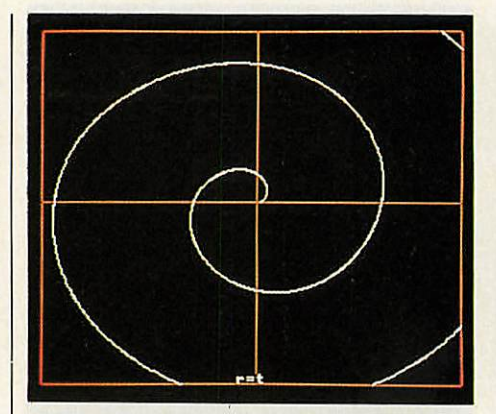
A second test is needed to detect the rarer case of the surface just touching zero, rather than passing through it. In this case the condition is that the central point should be a factor of 100 smaller than the sum of the sizes of the outer points (line 1050).

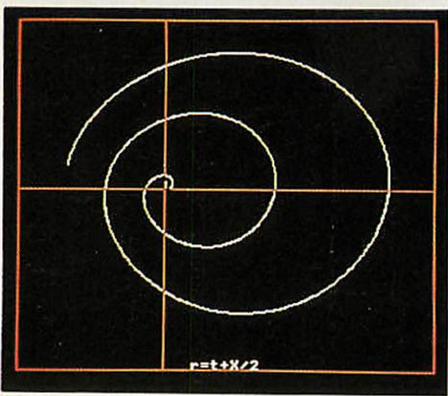
The rest of the program works as follows. First, the program prompts for the equation to be plotted (lines 110 to 170). As in the NEWT program, the equation in g$ is converted to an expression in f$ which can be EVALed (lines 180-190). Then the program prompts for the range of values over which the equation is to be plotted (lines 210 to 290). The screen will eventually show a picture of the curve for all values of X between xl and xr, and for all values of Y between yl and yu. These four variables define the 'window' through which we shall see the curve. The program allows strings to be typed for these four parameters, and uses EVAL so that the values can be entered as an equation, such as SIN(PI/3).

The program then calculates the co-ordinates (xa,ya) at which axes will be drawn; this is at the origin (0,0), or (xl,yl) if the origin is not within the window.

The program checks for the presence of either of the polar co-ordinates, r or t, and sets the logical variables any_r and any_t accordingly. If t is specified, the program prompts for the range of values for t over which the equation should be evaluated. Each 2*PI range corresponds to one full rotation around the plane; successive planes are plotted in sequence, counted by the variable 'sheet', which counts from losheet to hisheet (lines 380-440). Alternate sheets are plotted in two different logical colours, to avoid gaps at the overlap between sheets.

To save time when drawing the curve (for complicated functions in polar co-ordinates the program can be a little slow) it is drawn in small straight-line segments, rather than pixel-by-pixel. The variable 'arc' holds the approximate number of pixels in each straight-line segment. For faster plotting, at the cost of less smooth curves, alter arc to 5 in line 480.





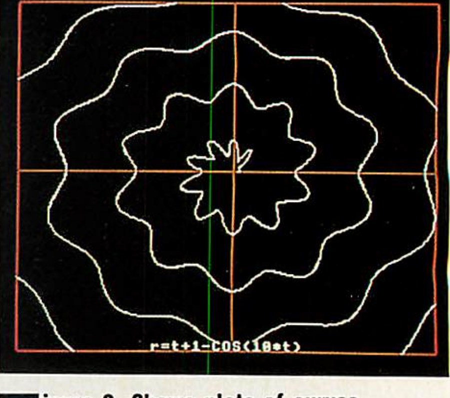


Figure 3. Shows plots of curves expresed in polar co-ordinates. 3(a) (above left). Plots a spiral described by the equation r=t. 3(b) (above right). Shows a spiral with a superimposed ripple, with equation r=t+1−COS(10*t). 3(c) (left). Plots an equation which mixes polar co-ordinates and cartesian co-ordinates; r=t+X/2

For similar reasons to those of NEWT, this program relies on 'ON ERROR GOTO' statements to keep the program going if it reaches values of X and Y where the function defining the curve is badly behaved (eg, tries to take the square root or logarithm of a negative number, or to divide by zero).

Because SPIDER calls these 'subroutines' from different places in the main program, the problem is slightly more serious than in NEWT, and a means is needed to return control to the correct point. Where a conventional program might have a procedure FNcloser that is called from two different places:

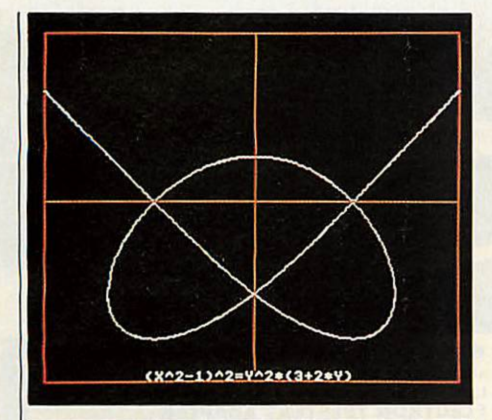
```
500 a = FNcloser(x1,y1)
510 REM next statement
......
600 b = FNcloser(x2,y2)
610 REM next statement
......
......
800 DEF FNcloser(x,y)
810 REM result in 'result'
......
890 = result
```

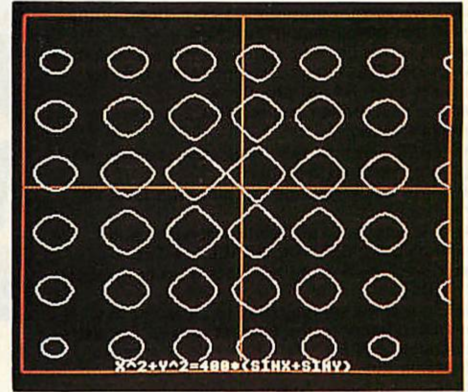
We avoid the use of functions, procedures or GOSUBs, by using a GOTO to call the routine. Before calling it a variable closer_ret, is set to a code number to indicate where control should be returned.

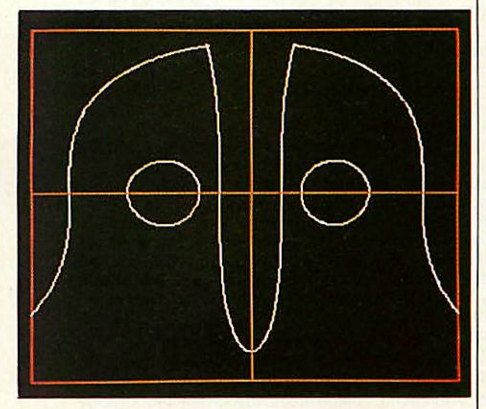
From the routine an ON . . . GOTO then returns to the correct line, with the result passed in a variable called result:

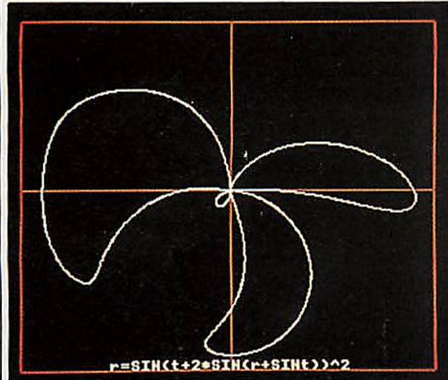
Figure	Equation	x		y		t	
1(a)	X^2^Y = Y^2^X	−8	8	−8	8		
1(b)	Y^2 = X^4−X^6	−1.1	1.1	−1.1	1.1		
1(c)	(Y−SINX)*(X+SINY) = 0	−2*PI	2*PI	−2*PI	2*PI		
2(a)	Y = TAN(X)	−2*PI	2*PI	−10	10		
2(b)	Y = LN(SIN(X^2))	−3	3	−3	1		
3(a)	r = t	−10	10	−10	10	0	4*PI
3(b)	r = t+1−COS(10*t)	−20	20	−20	20	0	8*PI
3(c)	r = t+X/2	−15	30	−20	20	−4*PI	4*PI
4(a)	(X^2−1)^2 = Y^2*(3+2*Y)	−2	2	−2	2		
4(b)	X^2+Y^2 = 400*(SINX+SINY)	−20	20	−20	20		
4(c)	(X^2+Y^3−1)*(ABS(ABSX−.5)^2+ Y^2−.04)*(X^2*30−Y^3−1) = 0	−1.2	1.2	−1.2	1.1		
4(d)	r = SIN(t+2*SIN(r+SINt))^2	−1.1	1.1	−1.1	1.1	0	2*PI
4(e)	?	−4	4	−4	4		

Table 1. The parameters used to plot the curves in figures 1 to 4









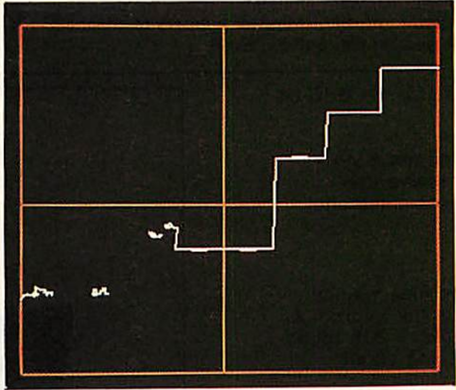


Figure 4. (Top row, left to right). 4(a). Plots the equation (X^2−1)^2=Y^2*(3+2*Y). 4(b). The result of the equation X^2+Y^2=400*(SINX+SINY). 4(c). See Table 1. The 'face' equation. 4(d). r=SIN(t+2*SIN(r+SINt))^2. 4(e). The plot of the mystery equation, written using only eight characters

```
500 X = x1: Y = y1: closer_ret = 1: GOTO 800
510 a = result
520 REM next statement
......
600 X = x2: Y = y2: closer_ret = 2: GOTO 800
610 b = result
620 REM next statement
......
......
800 REM 'Closer'
810 REM result in 'result'
......
890 ON closer_ret GOTO 510,610
```

Errors can now be trapped, and execution resumed at the correct line with a GOTO, since the values of variables such as closer_ret and result will be preserved intact. The routine FNeval uses the illegal word ERROR to cause a Basic error, so that the curve is not plotted across the boundary between different sheets.

Incidentally, an alternative way of implementing subroutine calls without using ON...GOTO is to use GOTO N, where N is a variable set to the line number to return to. However, this method has the disadvantage that the variables would have to be altered if the program was renumbered.

When you have first typed the program in, it's advisable to leave out the ON ERROR statements and test the program with a well-behaved function, such as Y = X^2, to show up any typing errors.

The main section of the program, lines 500 to 840, scans the X-Y plane horizontally and vertically. At each step, routine 'Closer' is called (line 600) to try to locate a branch of the curve. At each step towards the curve the program plots a point in red (lines 730 and 740) to show where the program is looking. Line 740 should be omitted if you do not want this feature. If routine 'Closer' does not find the curve, it makes up to 20 attempts before giving up its search and moving on to another cell.

If 'Closer' finds the curve within a scanning cell, the program branches to line 630, which plots a point and then follows along the curve by calling 'Follow'. The routine plots along the curve in one direction, line 650, and then starts from the same point and follows it in the opposite direction, line 680. Finally, the routine 'Plot' is called to plot a point or a line segment. Because 'Closer' may find a branch of the curve which has already been plotted, 'Plot' tests the screen with the POINT function before finally plotting, and 'Follow' will stop following a branch once three 'hits' have occurred.

'Closer' and 'Follow' both work by evaluating the function at four points in a square around the current point, and then testing to see whether there is a zero within the square. If 'Follow' loses the branch of the curve that it was following, it calls 'Closer' up to 20 times to try to find it again (lines 1310-1350) before giving up.

Finally, the program draws axes (lines 860 to 890), and waits for a key. If at this point you press the Space bar, a screen dump will be saved to disc; press Escape to exit otherwise.

Many of the parameters used by the program affect the speed of plotting, the accuracy of the final plot, and the program's ability to find small details in the curve, such as poles. The parameters concerned are: the arc length, arc; the resolution within each pixel square, epsilon; the scan cell size, xs and ys; the number of iterations of 'Closer' before moving to a new scan cell, ns and nn; the criteria for finding the curve, lines 1040 and 1050; and the number of 'hits' before a branch is no longer followed, line 1390.

Sample curves

Table 1 shows the parameters used to plot the curves in figures 1 to 4. In addition, line 770 of the program was omitted for these plots.

A lot of fun can be had inventing curves for the *Spider* to plot. The equation of the curve can include any Basic function, including SGN, ABS, and INT. Remember though that the 'raise to the power' operator is not defined for negative powers that are not exact integers.

To conclude the article we present five more unusual examples. Figure 4(c) is not as complicated as it looks, and shows how different curves can be superimposed by multiplying them together. The curve is the product of three simpler equations, each of which provides a different part of the 'face'. Figure 4(d) is one of a family of closed curves. Try the effect of altering the constant '2', or multiplying the innermost term '(r+SINt)' by a constant. Finally, figure 4(e) is left as a puzzle; the equation can be written using just eight characters!

See the index to yellow pages on page 113 for details of where to find the Spider listings.

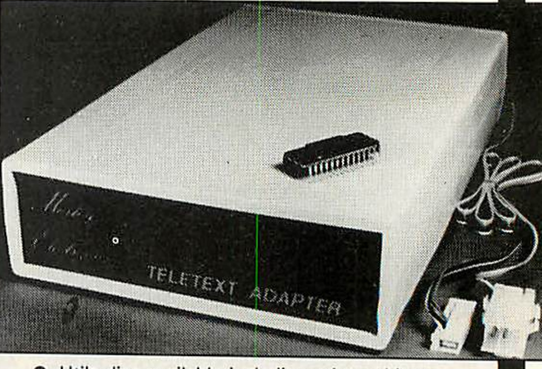
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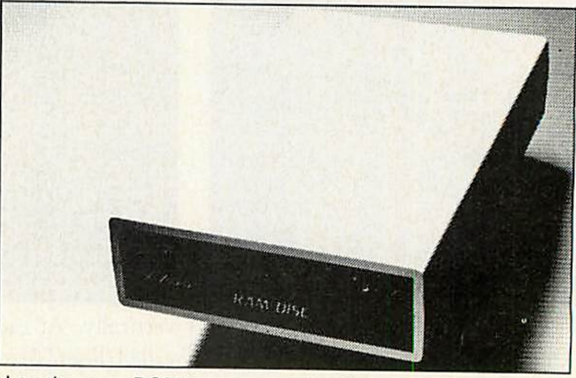
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TRAPPING ERRORS ON THE SIDE

The advent of sideways RAM has made writing your own ROMs a much more popular activity. Here we show you how to deal with error handling by sideways ROMs

Steve Picton

The recent emphasis on the benefits of sideways RAM has probably encouraged many readers to have a go at creating a ROM of their own, tailor-made to their individual requirements. Whether you want to write a short utility ROM or a complete 16k language, there is usually the problem of how to deal with errors. Error handling, more specifically error handling by sideways ROMs, is what we shall be looking at in this article.

If we are programming in Basic, there are essentially two ways in which we can deal with an error situation. As an example, look at the following piece of Basic code. The idea is simply to accept two numbers from the user, and print the result of integer division.

```
10 INPUT "Input the two numbers" ;A%,B%
20 C%=A%/B%
30 PRINT C%
```

There is really only one thing that can go wrong here, namely when B% is 0. There are two ways to take care of this:

1. Leave the program exactly as it is, and allow Basic to give us a 'Division by zero' message. (Whether or not ON ERROR has been used need not concern us here.)
2. Test for B% being equal to zero in advance, ie, we could add a line like:

```
15 IF B%=0 THEN PRINT "Impossible!":GOTO 10
```

In other words, we can often write our program in such a way that we anticipate and act upon problem situations before they arise, whether writing in Basic or Assembler. This strategy is not always possible, however, since we frequently have to pass control over to another ROM. When saving a program from Basic, for example, the Disc Filing System takes over for a while, and this has its own set of errors (eg Disc full, Not found, etc).

These type of errors are generated by the ROM that is processing the current command: they occur when the 6502 processor encounters a BRK instruction; eg Basic makes extensive use of BRK to deliver its error messages. For syntax see figure 1.

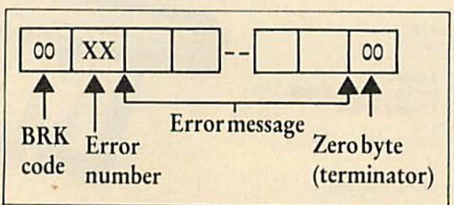


Figure 1. Message format

When the 6502 executes a BRK (opcode 00), the following events take place. (Most of these are inherent in the 6502 processor, rather than specific to the BBC micro.)

1. The address of the BRK instruction plus 2 is pushed on the stack, high byte first.
2. The status register is pushed on to the stack. The stack pointer is lowered by 3.
3. Interrupts are disabled, and bit 4 of the status register (the BRK flag) is set. This is done to allow the operating system to distinguish a BRK from an interrupt – see disassembly listings.
4. Execution continues from the address found at &FFFE and &FFFF. In OS 1.2, this address is &DC1C. If you have a different MOS, the address can be found by entering PRINT ~!&FFFE AND &FFFF.

It is worth looking at the routine at &DC16 in detail, since it summarises very neatly the important events that ensue after a BRK. (Although it is specific to OS 1.2, the principles are common to all versions.) Figure 2 is an annotated disassembly of the relevant section of the operating system and is, of course, subject to copyright. Some general points emerge:

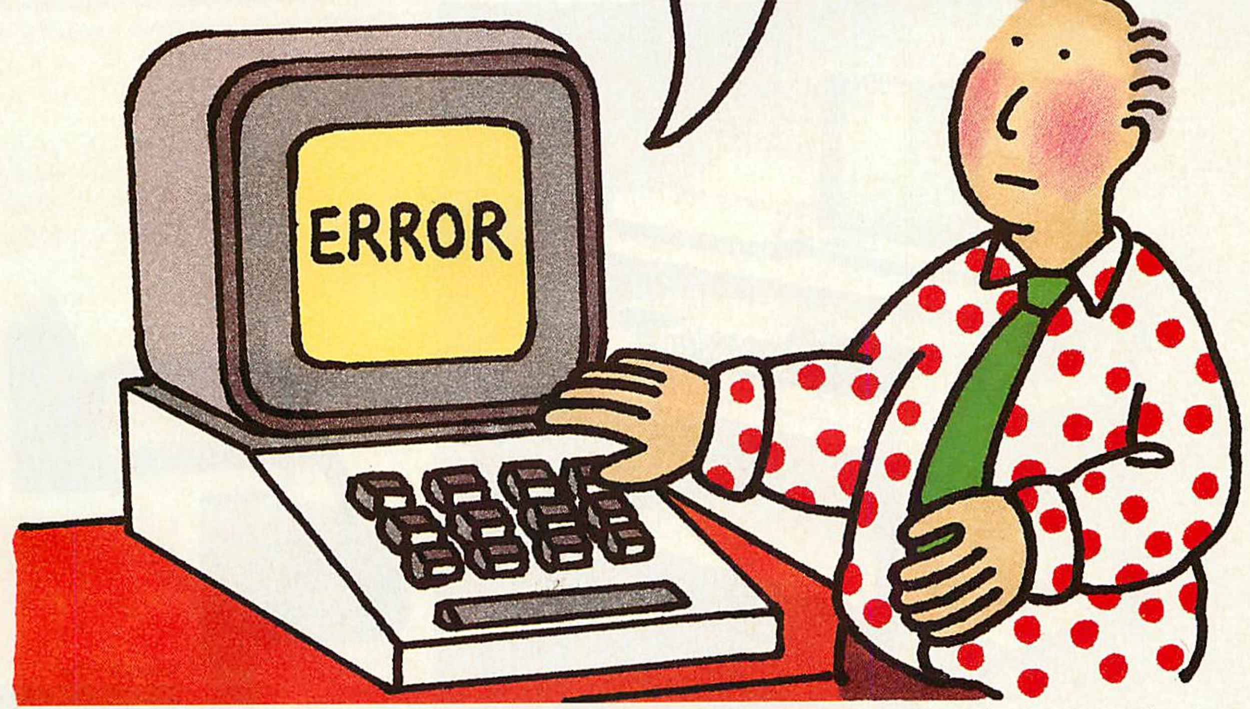
- If you wish to enable a particular ROM, do so by writing to &F4 and &FE30 in that order. There is no need to disable interrupts. Problems can arise if you write to &FE30 and then &F4, because of the effect of an interrupt occurring immediately after writing to &FE30, but before &F4 is updated.
- The code from &DC29 to &DC38 extracts the return address from the stack, placed there by the 6502 as a result of BRK. This address then has 1 subtracted from it, and the result is placed in &FD and &FE. Since the return address was that of the BRK instruction plus 2, (&FD) is made to point to the byte immediately after the BRK opcode. This is usually the error number associated with the error.
- Whenever a BRK occurs, all the paged ROMs are informed with service call 6 in the accumulator. As each ROM is entered, the Y register still contains the value that it had when the BRK occurred. The original value of the accumulator is in &FC, and the X register is on the stack, buried beneath a pile of numbers resulting from JSR instructions etc. You will need to use TSX followed by LDA Absolute, X to access it.
- The 'legal' method of finding out which ROM was active at BRK is via OSBYTE 186. This reads the byte at &24A, which contains a copy of the active ROM number.

It is the responsibility of the current language eventually to deal with the error. After interrogating each of the sideways ROMs, the operating system passes control back to that language via JMP (&202): &202 is in fact the Break Vector (BRKV). The language itself should set &202 and &203 to the address of its error handling routine when it is first initialised. Basic 2, for example, sets up these locations to point to &B402 and Basic 1 uses &B433.

Errors in a service ROM are easy enough to sort out. The only point to watch is that language ROMs do not expect the error message after a BRK to be in another sideways ROM. So if we are writing a ROM service routine and we wish to give, say, a 'Bad number' error,

ILLUSTRATION BY KATE TAYLOR





then we must copy that error message to an area of RAM first, and then jump to the BRK preceding it. The bottom of the machine stack, (ie from &100 onwards) is the official error message buffer. For example, this short piece of assembler could be used somewhere in a ROM if we had detected a 'Bad number'.

```
LDY #0
BRK opcode
STY &100
Put it in &100
.loop
LDA error_message, Y
Get the character
STA &101, Y
Copy it down to the stack
BEQ done
Exit when zero terminator is found
INY
BNE loop
Go back for another character
.done
JMP &100
execute the BRK
.error_message
Error no. + "Bad number" + 00
(terminator)
```

In practice, we might choose to make a routine such as this rather more general, so that it could handle many different messages – 'Too big', 'Syntax error' and so on.

If we wish to write a language ROM, then the onus is on us to set up the correct address at &202-&203 and to supply the routine actually to handle the error. There is no reason why a language should not have several different error handling routines – the ROM must decide which one is appropriate at each stage of proceedings, and update &202-&203 accordingly. The simplest of error handling routines might have two main requirements: to print out the message after the BRK, and to re-initialise the stack pointer.

Since (&FD) points to the data immediately after the BRK instruction, it is easy to print out the message itself. Indirect indexed addressing can be used to access the bytes. We are free to choose whether or not we make use of the error number.

```
.errorhandler
LDY #0
Initialise Y
LDA (&FD),Y
Get the error number
STA &70
Put it in &70 (say)
INY
Set Y=1
.loop
LDA (&FD),Y
Get the next character
BEQ endfound
Exit when terminator found
JSR &FFEE
Print it
INY
BNE loop
Go back for another
.endfound
continue
```

The second requirement, re-initialising the stack pointer, is more subtle but equally important. Consider these two Basic expressions:

```
Print 3/0
PRINT SQR(SQR(SQR(3/0)))
```

They will both of course give a 'Division by zero' error. What is not so obvious is that the machine stack will have more data on it when the error occurs in the second of the two examples. This is a consequence of the way in which Basic evaluates expressions. The important fact to emerge is the need to use LDX #255: TXS in order to prime the stack pointer after BRK, since the contents of the stack will be indeterminate. Failure to do this can eventually lead to the stack overflowing.

This month's yellow page offerings consist of two listings, both written as sideways ROMs. The first is a service ROM which will detect the command *MOVE, and then convert the hex number after it into binary. (This would obviously be necessary if you wanted

DC1C STA &FC	Save the accumulator
DC1E PLA	Retrieve a copy of the staus register into A
DC1F PHA	Push it back
DC20 AND #&10	Isolate the BRK flag
DC22 BNE &DC27	Skip forward if it is a BRK
DC24 JMP (&0204)	Jump to high priority interrupt handler
DC27 TXA	Save X on the stack
DC28 PHA	
DC29 TSX	Extract the low byte of the return
DC2A LDA &103,X	address fromthe stack
DC2D CLD	Ensure that we are in binary mode
DC2E SEC	Prepare for the forthcoming subtraction
DC2F SBC #&01	Subtract one
DC31 STA &FD	and save it in &FD
DC33 LDA &0104,X	Get the high byte of the return address
DC36 SBC #&00	Take account of any borrow
DC38 STA &FE	Place it in &FE
DC3A LDA &F4	Get the currently active ROM number
DC3C STA &024A	Place it in &24A. This means that &24A contains the ROM number that was active when the last BRK occured
DC3F STX &FO	Save X, now the stack pointer, in &FO
DC41 LDX #&06	Indicate a 'reason code' of 6
DC43 JSR &F168	Inform each ROM of the error
DC46 LDX &028C	Get the ROM number of the current language
DC49 JSR &DC16	Enable it by writing to &F4 and &FE30
DC4C PLA	Restore the X register
DC4D TAX	
DC4E LDA &FC	Get the accumulator back
DC50 CLI	Enable interrupts again. (Remember the 6502 automatically disables them after BRK)
DC51 JMP (&0202)	Pass control back to the current language
F168	This is the main 'ROM-scan' routine
F168 LDA &F4	Save the currently active ROM
F16A PHA	
F16B TXA	Move the reason code into A
F16C LDX #&OF	Indicate that ROM 15 is to be examined first
F16E INC &02A1,X	Make the sign flag reflect the type of
F171 DEC &02A1,X	ROM (if any) in this socket
F174 BPL &F183	Look at next one if it is empty, or Basic
&/F176 STX &F4	Place a RAM copy in &F4
F178 STX &FE30	Enable the ROM by writing to the select latch
F17B JSR &8003	Enter the ROM via its service entry point, treating the ROM as a subroutine
F17E TAX	Set the zero flag according to the value in A
F17F BEQ &F186	Exit if the ROM returned zero in A
F181 LDX &F4	Otherwise get the current ROM number
F183 DEX	Prepare to look at the next one
F184 BPL &16E	Go back if there are any more
F186 PLA	Retrieve the original ROM number
F187 STA &F4	Enable it
F189 STA &FE30	
F18C TXA	Move X back to A
F18D RTS	Exit

Figure 2. BRK handling routine within the operating system

to write a utility to move a Basic program from one page to another.) Three error conditions, 'Bad Hex', 'Too big' and 'Syntax error', are reported in the manner described previously.

The second listing is written as a language.

Program notes

Both programs assemble their code at &5000, and you will need to transfer it to sideways RAM in the normal way before it can be executed. On a B+ 128 or Master this can be done with a *SWRITE command; for other micros, consult your RAM board manual for details of loading ROM images. As usual, setting up the red function keys with commonly used assembler mnemonics can save a lot of typing effort. Both listings start off in the 'standard' way, so that the operating system will recognise them.

Listing 1 (Service ROM)

Lines 540-640 detect the command *MOVE.
Lines 660-700 set the two bytes for the result to zero, and get past any spaces.
Lines 720-1020 form the routine to convert a hex number to binary. The way the algorithm works should be clear when you consider the close relationship between a hex digit and its binary equivalent. We use ASL and ROL instructions to move each digit into the final result. &70 and &71 have been used for this purpose, and it is only Basic which guarantees that these locations will be free for the user. Therefore you should not experiment with *MOVE in any language other than Basic.
Lines 1050-1250 copy the error messages down to the bottom of the stack.
Lines 1280 actually executes the error.

Listing 2 (Language ROM)

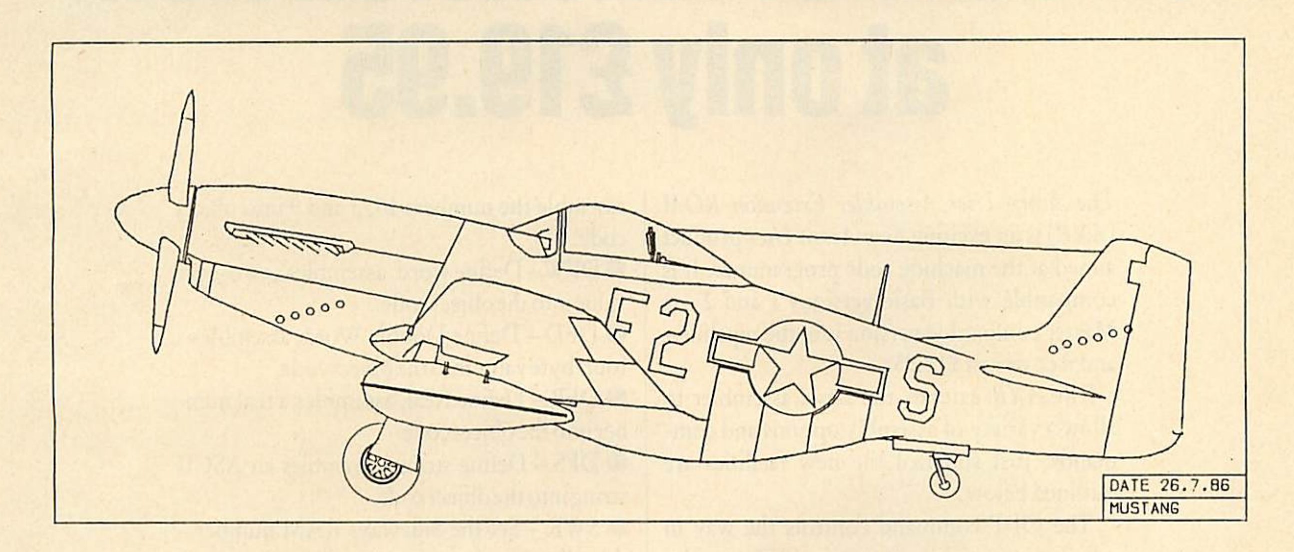
It is not very often that *Acorn User* publishes programs that are deliberately designed to cause errors! The way this simple language works is to give an error message describing the type of key that was pressed in response to the '?' prompt. The only exception occurs when an asterisk is entered, in which case the rest of the command is passed over to the OSCLI routine. This allows the use of, eg, *BASIC to exit the program.
Lines 490-590 detect the command *ERROR to start up the language.
Lines 610-630 use OSBYTE 142 to start the language.
Lines 650 is the language entry point. The first task is to set up the error vector (&202/&203) with the correct address.
Lines 720-740 initialise the stack, and enable interrupts. Languages are entered with interrupts disabled.
Lines 780-800 print out a '?', and use OSRDCH to wait for a keypress.
Lines 820-960 use a series of compare instructions to ascertain the type of key pressed.
Lines 990-1060 If an asterisk is pressed, we use OSWORD with A=0 to get a line of text into memory.
Lines 1080-1110 pass this text over to the OSCLI.
Lines 1130-1370 are the error messages themselves, following the usual format of BRK, error number, text, zero byte. Notice that we do not have to use 17 for the 'Escape' error number just because Basic does. In fact, there is no reason to adopt the error number/text/zero byte syntax, as long as you are certain that an error will never occur anywhere except your ROM. For example you could use a carriage return instead of a zero byte as an end-marker. As soon as you execute code outside your ROM however (eg, operating system calls), then the error handling routine should cater for the 'standard' form of errors.
Lines 1390-1500 are the error handler. The idea is simply to print out the error message, but we have ignored the error number. This is why LDY #1 rather than LDY #0 is used in line 1400.

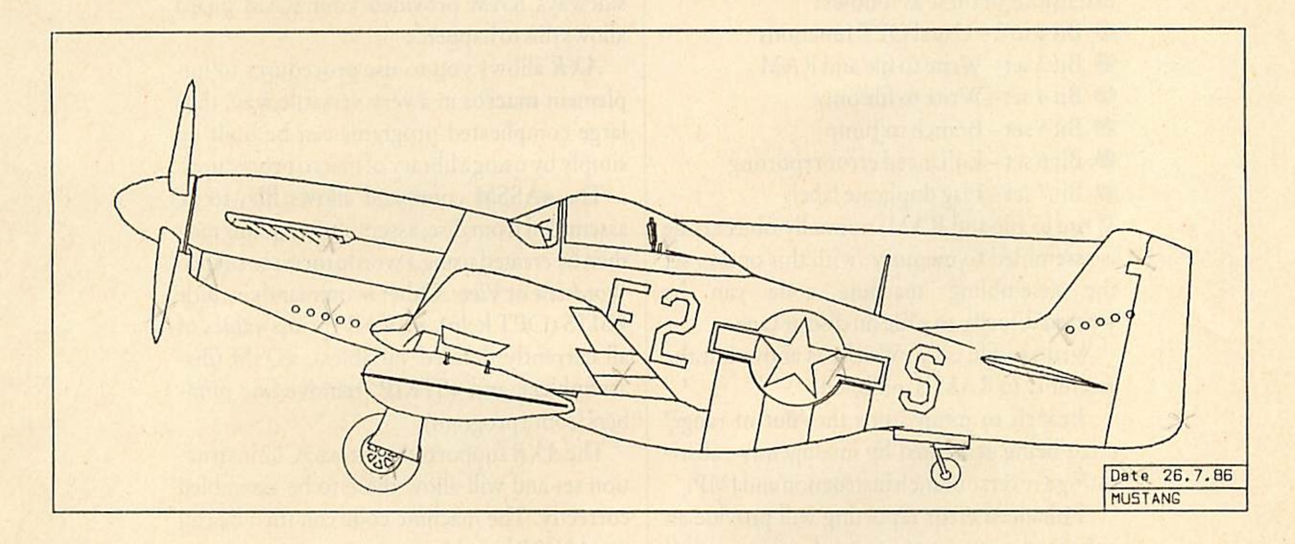
Steve Picton's listings for sideways ROMs are on the yellow pages. *See index on page 113.*

COMPETITION

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Ten sets of Technomatics's *Novacad* software are up for grabs if you can spot the differences between these pictures of Mustangs drawn using the package





Spot the differences between the two drawings of a World War 2 Mustang above, and you could win a copy of Technomatic's *Novacad* software which retails at £99 plus VAT. We've got 10 to be won by sharp-eyed readers, so get those magnifying glasses out.

The drawings of the Mustang were done using *Novacad* with an Epson H180 plotter, and the lower one has 15 differences for you to find. When you've spotted them, mark them with crosses on the *bottom* picture, cut it out and put it in an envelope. Don't forget to include your name and address. The senders of the first 10 correct entries drawn from the hat after the closing date will each win a copy of the *Novacad* package.

Novacad will work on a BBC micro with Acorn DFS and disc drive or Master from trackerball, mouse or keyboard, and is compatible with the 6502 seond processor.

This CAD (computer aided design) package has many features usually only found on custom-designed software. Whether you want to draw a complex electronic circuit board, make architectural plans or just doodle, then *Novacad* can help.

It's user friendly and allows great detail to be incorporated into drawings. You can build up libraries of icons you've created and call on them in any of your diagrams, and you can mirror, rotate, enlarge or reduce them. There's a zoom facility enabling magnification of a section by up to 20 times to allow fine details to be added.

Send your entry to October Competition, Acorn User, 141-143 Drury Lane, London WC2B 5TF.

Closing date for entries at the *Acorn User* office is October 20.

ACORN USER OFFERS

Acorn User's Assembler Extension ROM at only £19.95

The *Acorn User Assembler Extension ROM (AXR)* is an exciting new *Acorn User* product aimed at the machine code programmer. It is compatible with Basic versions 1 and 2 – a Master compatible version is in the pipeline – and it costs just £19.95.

The *AXR* extends the Basic assembler to allow a variety of assembly options and commands. Just some of the new facilities are outlined below.

The OPT command controls the way in which the assembler operates. *AXR* provides extensions of these as follows:

- Bit 0 to 2 – Usual OPT functions
- Bit 3 set – Write to file and RAM
- Bit 4 set – Write to file only
- Bit 5 set – Branch to Jump
- Bit 6 set – Enhanced error reporting
- Bit 7 set – Flag duplicate labels

Write to file and RAM: normally object code is assembled to memory, with this option set the assembling machine code can be written directly to a file on disc or tape.

Write to file only: Works as above but the assembly to RAM is inhibited.

Branch to jump stops the 'out of range' error being generated by intelligently substituting a reverse branch instruction and JMP.

Enhanced error reporting will provide an enhanced error message and print a small arrow below the offending instruction should any errors occur.

The *AXR* adds several new pseudo op codes to the assembler. These are:

ORG – sets the origin for assembly, this is similar in action to assigning P% with the assembly start address.

DST – Specify destination, allows offset assembly in a similar manner to Basic 2's 0% when used with OPT 4 TO 7.

DFB – Defines a byte, eg, DFB 13,3,9 will assemble the numbers 13, 3 and 9 into object code.

- DFW – Define word, assembles a two-byte value into the object code.
- DFD – Define Double Word, assembles a four-byte value into the object code.
- DFR – Define Real, assembles a real number into the object code.
- DFS – Define string, assembles an ASCII string into the object code.
- SWR – Set the Sideways RAM number – this allows code to be assembled directly to sideways RAM provided your RAM board allows this to happen.

AXR allows you to use procedures to implement **macros** in a very versatile way, thus large complicated programs can be built up simply by using a library of macro procedures.

The *ASSM command allows files to be assembled from disc, assembly programs may then be created using a wordprocessor such as *Wordwise* or *View*. Other *commands include *BITS (OPT help), *LVAR (prints values of all currently defined variables), *DSM (disassembler), and *STRIP (remove line numbers from a program).

The *AXR* supports the extra 65C02 instruction set and will allow these to be assembled correctly. The machine code can then be run on a 65C02-based processor.

Binary numbers may be used in assembler by prefixing the value by a %, ie LDA #%11110001. The use of '[' and ']' to enclose assembler statements is now a matter of choice – assembler and Basic can be mixed freely, ie: 100 IF byte%<255 THEN LDA #byte:RTS is allowed by AXR.

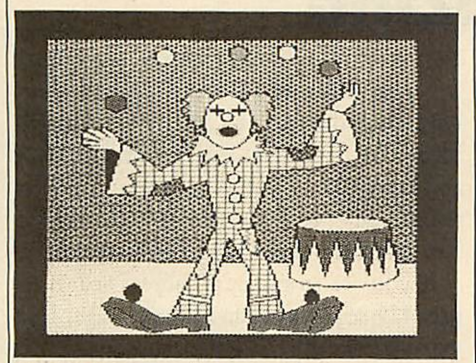
Our best-selling printer control ROM – *UserDump* and your favourite *UserROM* are still available, competitively priced at £19.95. See the order form on page 130.

Telephone Orders 01-836 2441 9.30am to 5.00pm. Ask for Seran – Order form on page 130

PROGRAM LISTINGS

ACORN USER OFFERS

October listings on cassette £3.95 or disc £5.95


The Mode Conversion program

The Mode Conversion program and *Spider* programs dominate the cassette and disc offerings this month, plus as an added bonus to disc users of *View* we include the latest in *View* printer drivers.

Phil Wilkes produced this month's graphic bonus which was featured as part of the opening ceremony for the Master Compact on this month's cover. It's on both cassette and disc.

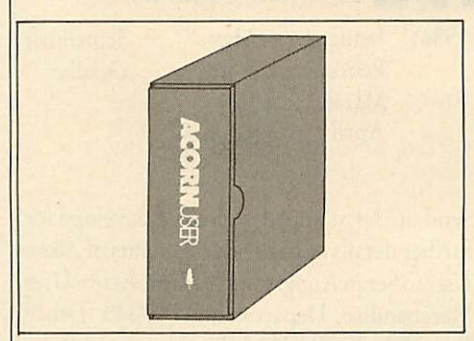
Dr Hock's View Printer Generator allows up to 31 short, 15 standard or seven long highlight codes to be entered.

The manual is in *View* format and can be dumped to your printer.

All the programs presented in this issue are on both disc and cassette. The disc is fully menu driven and a worthwhile investment at £5.95. Electron owners – remember the disc is fully compatible with the Advanced Plus 4 disc interface with 5.25 in drives.

The cassette contains versions of the programs for both BBC micros and Electron and includes a tape to disc transfer program – all for just £3.95! See order form on page 129.

Free disc binder – yours when you subscribe to our monthly listings disc



The disc binder is yours when you subscribe

This month we're offering you the chance to receive our superb quality disc binder worth £9.95 when you subscribe to our monthly listings disc. The binder, made up in grey cloth, includes six transparent inserts each capable of holding two 5.25 in discs and a protective slip case.

Send your remittance of £69 while this offer lasts. Overseas readers should add £7 for surface mail (and airmail to Europe), or £15 for airmail delivery (to the rest of the world).

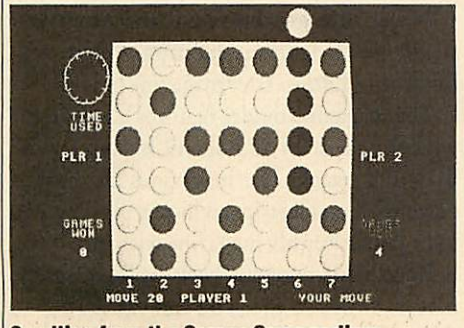
The discs contain all the program listings presented in each issue of *Acorn User*, so you don't have to type in the listings from the yellow pages – which saves you time, as well as money. Just load the disc and off you go.

Plus there's an added bonus – each month the discs contain exciting graphics screens, including some featured in the magazine.

Back issues of the monthly disc are available from October 1985.

Turn to page 129 for your order form.

Subscribe to our cassette listings and receive our games cassette – free



Quadline from the Games Compendium

We are pleased to offer you our new *Acorn User Games Compendium* cassette, free, when you subscribe to our monthly cassette listings, regularly delivered each month to your door, for £45.

Our listings cassettes will save you the time and trouble of keying in our monthly listings from the yellow pages, leaving you free to get on and enjoy the programs.

The *Games Compendium* features some really great entertainment for BBC micro, Master and Electron owners. It includes old favourites such as *Spectromania*, *Quadline*, *Picture Slide* and *3-D Maze*. Sample the delights of the *Acorn User* office in an adventure. Go collecting apples in *Shuggy's Garden*, or be all at sea in, *Run Silent, Run Deep*.

As a special bonus for BBC micro and Master owners try Rob Anderson's adventure with scrolling graphics – never published before in *AU*. All programs can be transfered to disc automatically. Order form on page 129.

Telephone Orders 01-836 2441 9.30am to 5.00pm. Ask for Seran – Order form on page 129

MAGAZINES & BINDERS

ACORN USER OFFERS

Three issues free – when you subscribe to Acorn User magazine


15 magazines for the price of 12

If you've enjoyed reading this issue of *Acorn User*, the biggest and best-selling BBC/Acorn magazine, why not ensure you receive your monthly copy regularly by subscription?

At the same time you'll be able to take advantage of our super special offer, and receive 15 issues of *Acorn User* magazine for the price of 12 – only £17.50.

How else can you make sure you are up-to-date with the latest innovations, news, reviews and features. Stay in touch each month with *Acorn User* magazine, the biggest and the best!

You'll find articles covering education, business and home use, and there's a special section for new users. There are articles, hints and listings for all Acorn machines. This offer is only open to readers in the UK and the Republic of Ireland. Order form page 52.

If you are an overseas subscriber turn to page 129, so that you can take advantage of our two-year rate offer. We will send you 27 issues for the price of 24.

Acorn User Magazine Back Issues – £1.75


Classic issues from yesteryear

The following back issues are available by using the order form on page 130

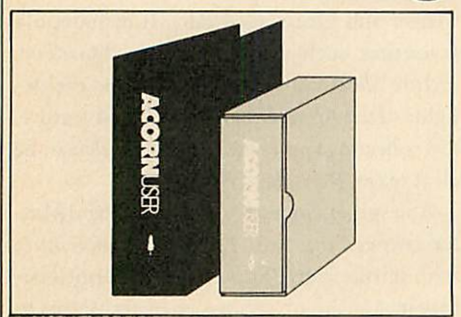
1984: May, June, July, August, September, October, November, December

1985: January, March, April, May, June, July, August, September, October, November

1986: January, February, March, April, May, June, July, August, September, October

Send an A4 stamped addressed envelope for further details of back issue contents of *Acorn User* to Seran Anderson Haddick, Acorn User Merchandise Department, 141-143 Drury Lane, London WC2B 5TF.

Disc Binder and Slip Case £9.95 and Magazine Binder £4.95


Magazine binder and disc binder

What better way to protect your *Acorn User* monthly disc listings, or your own programs, than in the safety of this fine grey cloth disc binder? The binder is lined in grey, and has a 30mm capacity, big enough to hold 12 monthly discs comfortably. The spine of the binder features a discreet silver *Acorn User* logo.

Included with the disc binder are six transparent inserts, each capable of holding two 5¼" discs. Last, but most importantly, there is a sturdy slip case for protection.

Never lose another issue and keep your *Acorn User* magazine collection in style, with this fine red *Acorn User* magazine binder.

The magazine binder features a wide spine with the capacity to hold 12 issues of more than 200 pages. The magazines are held in place with metal strips, which will allow you to fit your monthly magazine with ease.

Keep your precious back issues in safety, filed in order so that you can easily refer to them. The order form is on page 130.

Telephone Orders 01-836 2441 9.30am to 5.00pm. Ask for Seran – Order form on page 130

SPECIAL PROGRAMS

ACORN USER OFFERS

Acorn User Gallery Disc – super graphics for only £6.95



Malcolm Banthorpe's life-like Coke can

The *Acorn User Gallery* disc has proved to be immensely popular since its introduction in August. It features an automatic scrolling display of over 20 stunning graphic screens.

What's more, the disc gives you the chance to dabble with a little creativity, by using the Super Painter and Pixel Editor.

These clever graphics creating programs, included on the disc, allow you to alter and edit these pictures as you like, and also give you the chance to concoct your own designs.

You can marvel at Spiderman, see the Coke can come alive, plus Robotic Brilliance, Astronaut, Elite, Wimp Fashion, Max Headroom, Sunrise, Thomas the Tank Engine, and many more screens.

And don't forget you can use our *User-Dump* ROM to print all these screens too!

The Gallery disc is available as a single 80-track disc or two 40-track discs containing over 400k of graphics, costing just £6.95. Order form on page 129.

New this month! Acorn User's Games Compendium Cassette – £3.95



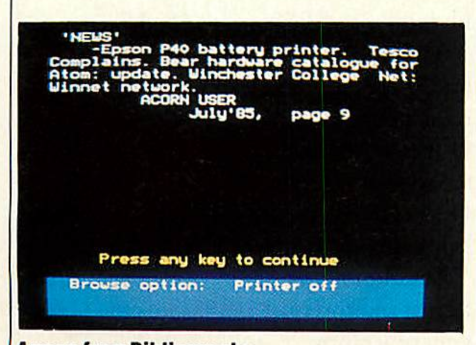
Spectromania: compendium blockbuster

The *Acorn User Games Compendium* brings the best games published in *AU* over the past two years to BBC micro, Master and Electron owners. Included are David Acton's blockbuster *Spectromania* and the popular *Quadline* – see if you can get four in a row! Puzzle fanatics will get great enjoyment from our *Picture Slide* game while many will be amazed at Dave Lawrence's *3-D Maze*. Adventurers can sample the delights of the *Acorn User* office. Autumn's coming, so why not go collecting apples in *Shuggy's Garden*, or be all at sea in *Run Silent, Run Deep*?

As a special bonus for BBC micro and Master owners, there is Rob Anderson's adventure with scrolling graphics – never published in *AU*. All programs can be transferred to disc automatically if desired.

You'll still find the *Best of Acorn User* and the *Graphics* cassettes available – see the order form on page 130. Each of our special cassettes is keenly priced at £3.95.

Acorn User bibliography on disc – from £7.95



A page from Bibliography

If you've ever spent hours looking through your copies of *Acorn User* for an elusive article, which you know you've seen but can't remember when or where, then what you need is the *Acorn User* bibliography!

Our bibliography contains information on where to find games, listings, educational and utility programs; reviews of hardware, firmware, peripherals, software and books; and feature articles of specific and general interest. You'll even find reference to readers' letters! The *Acorn User* bibliography is sold in parts, in a specially enhanced format, which will make your searches even faster, taking about 15 seconds on the 40-track and 40 seconds on the 80-track disc. Location of a reference is by one- or two-string searching and the user may specify the starting month and year. Output may be to screen or printed.

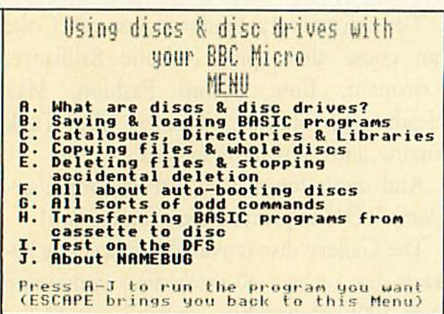
There are three parts currently available; part 4, will be released later in the year. Order form on page 129.

Telephone Orders 01-836 2441 9.30am to 5.00pm. Ask for Seran – Order form on page 129

SPECIAL PROGRAMS

ACORN USER OFFERS

Get out of trouble with the Disc Help Disc – only £6.95


Using discs & disc drives with
your BBC Micro
MENU
A. What are discs & disc drives?
B. Saving & loading BASIC programs
C. Catalogues, Directories & Libraries
D. Copying files & whole discs
E. Deleting files & stopping accidental deletion
F. All about auto-booting discs
G. All sorts of odd commands
H. Transferring BASIC programs from cassette to disc
I. Test on the DFS
J. About NAMEBUG

Press A-J to run the program you want
(ESCAPE brings you back to this Menu)

The *Disc Help Disc*'s menu page

Have you just bought a disc interface or disc drive? Do you have a disc interface and drive but are bamboozeled by all the jargon? Do you simply want to know all about discs and how to use your Disc Filing System ROM to its full potential?

If you answer yes to any of these questions then *Acorn User* has the answer in the form of the *Disc Help Disc*, specially developed for the magazine by the North and Mid-Essex BBC Users Group.

Simply insert the *Disc Help Disc* into your drive and, once run, all the information you will ever need is at your finger tips. All aspects of file maintenance are covered and included is a Disc Filing System simulator to allow you to practise use of the commands.

A 'question and answer' tutorial at the end of each section ensures that you are able to evaluate your own knowledge. The disc is in 80-track format only. Order using the form on page 129.

Wise up with the Education Disc at just £7.95



***Eco-Fax* is one of the disc's programs**

The *Education Disc* contains programs drawn from past issues of *Acorn User* magazine.

Eco-Fax is a sophisticated viewdata-type database for use on Econet systems, and comes with its own versatile frame editor. There is a colourful version of *Turtle Logo*; a program which shows equations as graphs; and a music writing program which allows you to edit tunes.

Graphics are a strong feature of the collection, which includes the *Easyplot* drawing software, supported by two other programs which use *Easyplot* screens as an electronic noticeboard or in place of an overhead projector. There is a bulletin board that displays a message in huge scrolling characters.

There are routines to use in your own Basic programs – screen dumps, a machine code utility which forces text input to upper case, and graphics plotting and drawing commands in mode 7. Plus a program to transfer files from tape to disc. Order form on page 129.

Network Utility Disc only £19.95

Acorn User — Network Utilities

The Acorn User Network Utilities fall into four categories. The following pages contain instructions on using the utilities.

User Utilities (Basic)............951
User Utilities (Network)..........952
Manager Utilities.................953
Demonstration Programs............954

For details about how to use NetFax refer to page 960

Bring teletext information to networks

The *Acorn User Network Utility Disc* is the logical addition to your network, combining a wide range of invaluable routines with a sophisticated, yet easy-to-use teletext information system. The disc features:

- NetFax – our hybrid information system. NetFax can provide thousands of pages of information which may be read without affecting any text or program in memory. It features an advanced teletext editor.
- Utilities for all network users, including a file locator and directory size finder.
- Utilities for network managers, including a bridge-compatible screen viewer and an efficient 'notify-all' facility.
- An auto-installer to transfer all of our utilities to your net painlessly.
- 150 NetFax pages, including instructions, help pages and sample indexes.

The *Acorn User Utility* disc is in 80-track format and costs just £19.95. See page 129 for your order form.

Telephone Orders 01-836 2441 9.30am to 5.00 pm. Ask for Seran. Order form on page 129

YELLOW PAGES

INDEX/COMPATIBILITY

Entering listings

To make the task of entering listings easier, *Acorn User* has adopted several standards in the Yellow Pages. Programs are listed with line numbers in increments of 10, so type AUTO <Return> for automatic line numbering before you start. Before you list what you've entered, type LISTO 1 <Return> to provide spaces after the line numbers. Programs in the Yellow Pages are often listed to a width of 40 characters, so type MODE 6 <Return> before you start. Comparing the line-endings of your listing with the Yellow Pages will help you spot extra or missing characters.

To make sure that the program you want to enter will work on your particular machine, check the index below. All the listings work with Basic 1, 2 and 4 (unless stated otherwise) and with operating system OS1.2 or above. If a program is accompanied by an article, please read the article first. If special care is needed when entering a listing, we provide a 'How to Enter' box.

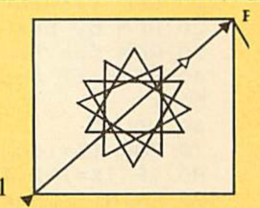
Once you've typed in your program, save it to tape or disc then test it by running it. If you've made a mistake, an error message will probably appear, telling you which line contains the error.

List the line and check it carefully against the published version.

If the line is the start of a procedure definition – eg, 1000 DEF PROCfred – the error may be a line which calls the procedure.

TURTLE GRAPHICS GROWS UP

115
Joe Telford extends Logotron's turtle graphics capabilities using the Master or the Graphics Extension ROM on page 81



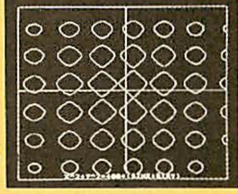
ART TO ART CONVERSION

117
Converting graphics screens from one mode to another is easy, with Phil Wilkes' program. See page 88.

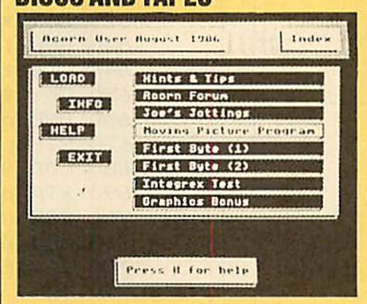


SPIDER POWER

119
David Johnson-Davis and David Deutsch's a curve-plotting program that can plot almost any equation on page 93.



DISCS AND TAPES



All the listings on these pages can be found on this month's listings disc or cassette. See page 109 for details.

BACK ISSUES







For help with entering and debugging listings see the following back issues: April '86, June '85, Aug '84 and Sept '83.

Program		Page	BBC B	BBC B+/128k	BBC with ADFS	Shadow RAM	Electron	Electron with Plus 1	Electron with Plus 1 & Plus 3	Master 128	Master 128 + ADFS	Master Compact	6502SP	Econet	Monthly cassette & disc
Hints & Tips	Listing 1	114	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
First Byte	Listing 9	114	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Joe's Jottings	Listing 1	115	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(b)
Mode Conversion	Listing 1	117	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y
	Listing 2	118	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y
	Listing 3	118	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y
Spider	Listing 1	119	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Listing 2	119	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SRAM Errors	Listing 1	121	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(a)
	Listing 2	122	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(a)
Econet Utilities	Listing 1	123	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Listing 2	124	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Listing 3	124	N	N	N	Y	N	N	N	Y	Y	Y	Y	Y	Y
	Listing 4	125	N	N	N	Y	N	N	N	Y	Y	Y	Y	Y	Y
	Listing 5	126	N	N	N	Y	N	N	N	Y	Y	Y	Y	Y	Y
Top of the List	Listing 1	126	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y
	Listing 2	127	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y

(a) Needs sideways RAM
(b) Needs Logotron Logo (and G×R if possible)

See Hints & Tips, page 49

Listing 1. Prints out teletext characters

```
 10 REM Teletext characters on printer
 20 REM by Edmundo Herrero
 30 REM for BBC B/B+/M/E
 40 REM (c) Acorn User October 1986
 50 :
 60 VDU 2
 70 FOR T%=160 TO 255
 80 IF T%=192 THEN T%=224
 90 PRINT'"Character ";T%;" ";
100 PROCteletext(T%)
110 NEXT T%
120 VDU 3
130 END
140 :
150 DEF PROCteletext(N%)
160 IF N%<160 OR N%>255 THEN ENDPROC
170 IF N%>191 AND N%<224 THEN ENDPROC
180 N%=N%-160
190 f=N% DIV 64:N%=N% MOD 64
200 e=N% DIV 16:N%=N% MOD 16
210 d=N% DIV 8:N%=N% MOD 8
220 c=N% DIV 4:N%=N% MOD 4
230 b=N% DIV 2:a=N% MOD 2
240 g=7*e+24*c+224*a
250 h=7*f+24*d+224*b
260 VDU 1,27,1,75,1,6,1,0
270 VDU 1,g,1,g,1,g
280 VDU 1,h,1,h,1,h
290 ENDPROC
```

See First Byte, page 55

Listing 9. Proportional Spacing Routine

```
  10 REM First Byte listing 9
  20 REM Proportional Spacing Routine
  30 REM by Tessie Revivis
  40 REM for BBC B/B+/M/E
  50 REM (c) Acorn User October 1986
  60 :
  70 MODE 4
  80 VDU 19,0,4,0,0,0
  90 PROCinit
 100 PROCass
 110 PROCchecksum
 120 PROCtest
 130 END
 140 :
 150 DEF PROCinit
 160 code%=&3000:mess%=&2F00
 170 oswrch=&FFEE:osword=&FFF1
 180 char=&70:count=&71
 190 block%=&73
 200 work%=&7C
 210 ENDPROC
 220 :
 230 DEF PROCass
 240 FOR pass%=0 TO 3 STEP 3
 250 P%=code%
 260 [OPT pass%
 270 .start
 280 LDA #0
 290 STA char
 300 .charloop
 310 LDX char
 320 LDA mess%,X
```

Continued ►

◄ Continued

```
 330 CMP #13
 340 BNE notlastchar
 350 RTS
 360 :
 370 .notlastchar
 380 CMP #32
 390 BNE notspace
 400 LDA #12
 410 STA plotpars+2
 420 LDA #0
 430 STA plotpars+3
 440 JSR doplot
 450 BEQ nextchar
 460 :
 470 .notspace
 480 STA block%
 490 LDX #block% MOD 256
 500 LDY #block% DIV 256
 510 LDA #&A
 520 JSR osword
 530 JSR copy
 540 .leftloop1
 550 LDX #7
 560 .leftloop2
 570 ASL work%,X
 580 BCS leftbitfound
 590 DEX
 600 BPL leftloop2
 610 INY
 620 CPY #8
 630 BNE leftloop1
 640 .leftbitfound
 650 CPY #0
 660 BNE nottoowide
 670 STY plotpars+3
 680 LDA #4
 690 STA plotpars+2
 700 JSR doplot
 710 BEQ noleft
 720 .nottoowide
 730 DEY
 740 JSR sub
 750 .noleft
 760 LDA block%
 770 JSR oswrch
 780 JSR copy
 790 .rightloop1
 800 LDX #7
 810 .rightloop2
 820 LSR work%,X
 830 BCS rightbitfound
 840 DEX
 850 BPL rightloop2
 860 INY
 870 CPY #8
 880 BNE rightloop1
 890 .rightbitfound
 900 JSR sub
 910 .nextchar
 920 INC char
 930 BNE charloop
 940 :
 950 .copy
 960 LDY #8
 970 .copyloop
 980 LDA block%,Y
 990 STA work%-1,Y
1000 DEY
```

Continued ►

◀ Listing 9 continued

```
 1010 BNE copyloop
 1020 RTS
 1030 :
 1040 .sub
 1050 TYA
 1060 ASL A
 1070 ASL A
 1080 BEQ noplot
 1090 STA count
 1100 LDA #0
 1110 SEC
 1120 SBC count
 1130 STA plotpars+2
 1140 LDA #0
 1150 SBC #0
 1160 STA plotpars+3
 1170 :
 1180 .doplot
 1190 LDX #0
 1200 .doplotloop
 1210 LDA plotpars,X
 1220 JSR oswrch
 1230 INX
 1240 CPX #6
 1250 BNE doplotloop
 1260 .noplot
 1270 RTS
 1280 :
 1290 .plotpars
 1300 OPT FNequb(25)
 1310 OPT FNequb(0)
 1320 OPT FNequw(0)
 1330 OPT FNequw(0)
 1340 .endofcode
 1350 ]NEXT pass%
 1360 ENDPROC
 1370 :
 1380 DEF PROCchecksum
 1390 total%=0
 1400 FOR byte%=code% TO endofcode
 1410 total%=total%+?byte%
 1420 NEXT byte%
 1430 IF total%<>18672 PRINT"checksum er
ror in assembler.":VDU7:END
 1440 ENDPROC
 1450 :
 1460 DEF PROCtest
 1470 VDU 12,5
 1480 T%=1000
 1490 REPEAT
 1500 MOVE 40,T%
 1510 READ text$
 1520 IF text$<>"" PROCprop(text$)
 1530 T%=T%-40
 1540 UNTIL text$=""
 1550 MOVE 40,T%
 1560 PROCprop("(Code size : "+STR$(P%-c
ode%)+" bytes)")
 1570 VDU 4
 1580 ENDPROC
 1590 :
 1600 DEF PROCprop($mess%)
 1610 CALL start
 1620 ENDPROC
 1630 :
 1640 DEF FNequb(byte%)
 1650 ?P%=byte%
 1660 P%=P%+1
```

Continued ▶

◀ Continued

```
 1670 =pass%
 1680 :
 1690 DEF FNequw(word%)
 1700 ?P%=word% MOD 256
 1710 P%?1=word% DIV 256
 1720 P%=P%+2
 1730 =pass%
 1740 :
 1750 DATA "This is a demonstration of p
roportional printing"
 1760 DATA "on the BBC Micro, Master and
 Electron computers."
 1770 DATA "Note that more than 40 colum
ns of text may be"
 1780 DATA "displayed on a mode 4 screen
."
 1790 DATA " "
 1800 DATA "The full character set is av
ailable:"
 1810 DATA " "
 1820 DATA "ABCDEFGHIJKLMNOPQRSTUVWXYZ"
 1830 DATA " "
 1840 DATA "abcdefghijklmnopqrstuvwxyz"
 1850 DATA " "
 1860 DATA "0123456789"
 1870 DATA " "
 1880 DATA "!""#$%&'()=-~^|\`_{[@+;*:}]?
/><"
 1890 DATA " "
 1900 DATA ""
```

How to enter the Logo program

The line numbers in the listing are for your reference only – do not type them into Logo

See Turtle Graphics Grows Up, page 81

Listing 1. The Logo program

```
TO PICTURE
COLOURS GROUND SKY CLOUD
TREE HOUSE PATH SUN
END

TO COLOURS
SETPAL 2 2
SETPAL 3 6
MIX 1 1 2
MIX 2 1 3
MIX 3 0 2
MIX 4 0 3
END

TO GROUND
LT 90 PU FD 638 LT 90 FD 380
.SETNIB 101 SETPC 2 SETPOS [636 8]
PU HOME
END

TO SKY
HT GCOL 64 0 PAINT
```

Continued ▶

◀ **Joe's listing 1 continued**

```
FD 0 REPEAT 23 [FD 16]
PU HOME
END

TO CLOUD
PU HOME
SETPOS [-300 270]
LT 90 FD 250
.SETNIB 205
HT GCOL 32 0
SETPOS [-300 380]
PU HOME
END

TO TREE
PU SETPOS [-400 -320]
.SETNIB 101
HT GCOL 16 0
SETPOS [-350 200]
PU SETH 0 LT 90 FD 25 LT 90
LEAVES
END

TO HOUSE
WALLS ROOF DOOR WINDY
END

TO PATH
PUSETPOS [400 -200]
SETPC 0 LT 135 FD 250
RT 45 .SETNIB 117 FD 110
END

TO SUN
PU HOMESETPOS [500 250]
HT GCOL 16 0
.SETNIB 157 FD 50
PU HOME
END

TO SETPAL :logical :actual
VDU ( SE [19] :logical :actual [0 0 0 0 0 0] )
END

TO PAINT
.SETNIB 133
FD 0
END

TO LEAVES
FD 0
.SETNIB 157
HT GCOL 48 0
FD 200
PU HOME
END

TO WALLS
BK 200
.SETNIB 101
SETPC 1
SETPOS [500 100]
PU
END

TO ROOF
MIX 3 0 1 HT GCOL 48 0
```

Continued ▶

◀ **Continued**

```
FD 0 FD 0 .SETNIB 85
LT 45 FD 80
LT 45 FD 388
LT 45 FD 80
LT 135 FD 500 LT 90
END

TO GCOL :mode :col
VDU ( SE [18] :mode :col )
END

TO MIX :pat :c1 :c2
VDU ( SE [23] 11 + :pat :c1 :c2 : c2 :c1 :c1 :c2 :c2 :c1 )
END

TO DOOR
MIX 3 2 3 PU
BK 300 LT 90 FD 200
RT 90 .SETNIB 101
GCOL 48 0 SETPOS [400 50]
END

TO WINDY
PU LT 90 FD 150 LT 45
.SETNIB 101 SETPC 3
FD 200 PU HOME
END
```

See Art to Art Conversion, page 88

How to enter the mode convertor

*The demo program converts a mode 2 screen to mode 1 then to Mode 0. If you have a mode 2 picture of your own then change lines 80, 110 and 150 of 'DEMO' to *LOAD your screen.*

If you do not have a mode 2 screen, then enter and run 'DEMOPIC'. This draws a simple mode 2 screen and saves it as 'TESTPIC'. If you do this, no changes will be necessary in the demo program.

You can use this month's graphics bonus 'RIBBON' on the listings disc and cassette to try converting a mode 1 screen to mode 0. However it will need decompacting. This can be done by entering the following program:

```
10*LDPIC RIBBON
20 VDU 7:key=GET
30*SAVE PICTURE 3000+5000
```

To see the conversion, delete lines 70 to 160 and instead enter the following:

```
70 MODE 1:REM set original mode
80*LOAD PICTURE
90 get%=GET
100 MODE 0:REM set new mode
110*LOAD PICTURE
120 PROCconvert10
130 END
```

Listing 1. Source code for Mode Convertor

```
>
   10 REM Mode Converter listing 1
   20 REM by Phil Wilkes
   30 REM for B/B+/M/E
   40 REM (c) Acorn User October 1986
   50 :
   60 MODE 4
   70 PROCtables
   80 PROCcode
   90 PROCchecksum
  100 PROCsave
  110 END
  120 :
  130 DEF PROCtables
  140 even10%=&1600
  150 even20%=&1800
  160 even21%=&1880
  170 odd10%=&1700
  180 odd20%=&1840
  190 odd21%=&18C0
  200 pointer%=&70
  210 PRINTTAB(0,10)"Please wait - creat
ing conversion tables"
  220 mask%=&88
  230 FOR screen%=0 TO 255
  240 S%=screen%
  250 D%=0
  260 E%=0
  270 FOR pix%=0 TO 3
  280 C%=S% AND mask%
  290 IF C%=136 THEN D%=D%+3:E%=E%+3
  300 IF C%=128 AND (pix% MOD 2)=1 THEN
D%=D%+1:E%=E%+3
  310 IF C%=128 AND (pix% MOD 2)=0 THEN
D%=D%+3:E%=E%+1
  320 IF C%=8 THEN D%=D%+1::E%=E%+2
  330 IF pix%<3 THEN S%=S%*2:D%=D%*4:E%=
E%*4
  340 NEXT pix%
  350 even10%?screen%=E%
  360 odd10%?screen%=D%
  370 NEXT screen%
  380 mask%=42
  390 FOR screen%=0 TO 63
  400 S%=screen%
  410 D%=0
  420 E%=0
  430 FOR pix%=0 TO 1
  440 C%=S% AND mask%
  450 IF C%=42 THEN D%=D%+15:E%=E%+15
  460 IF C%=10 THEN D%=D%+7:E%=E%+15
  470 IF C%=40 THEN D%=D%+7:E%=E%+13
  480 IF C%=8 THEN D%=D%+7:E%=E%+13
  490 IF C%=34 THEN D%=D%+10:E%=E%+5
  500 IF C%=2 THEN D%=D%+10:E%=E%+5
  510 IF C%=32 THEN D%=D%+8:E%=E%+2
  520 IF pix%=0 THEN S%=S%*2:E%=E%*16:D%
=D%*16
  530 NEXT pix%
  540 even20%?screen%=E%
  550 odd20%?screen%=D%
  560 NEXT screen%
  570 FOR screen%=0 TO 63
  580 S%=screen%
  590 D%=0
  600 E%=0
  610 FOR pix%=0 TO 1
  620 C%=S% AND mask%
  630 IF C%=42 THEN D%=D%+51:E%=E%+51
```

Continued ►

◄ Continued

```
  640 IF C%=10 THEN D%=D%+49:E%=E%+50
  650 IF C%=40 THEN D%=D%+48:E%=E%+48
  660 IF C%=8 THEN D%=D%+16:E%=E%+32
  670 IF C%=34 THEN D%=D%+18:E%=E%+33
  680 IF C%=2 THEN D%=D%+3:E%=E%+3
  690 IF C%=32 THEN D%=D%+1:E%=E%+2
  700 IF pix%=0 THEN S%=S%*2:E%=E%*4:D%=
D%*4
  710 NEXT pix%
  720 even21%?screen%=E%
  730 odd21%?screen%=D%
  740 NEXT screen%
  750 ENDPROC
  760 :
  770 DEF PROCcode
  780 P%=&1500
  790 [
  800 .ch10
  810 LDA #0
  820 STA pointer%
  830 TAX
  840 LDA #&30
  850 STA pointer%+1
  860 .loop
  870 LDA (pointer%,X)
  880 TAY
  890 LDA even10%,Y
  900 STA (pointer%,X)
  910 INC pointer%
  920 LDA (pointer%,X)
  930 TAY
  940 LDA odd10%,Y
  950 STA (pointer%,X)
  960 INC pointer%
  970 BNE loop
  980 INC pointer%+1
  990 BPL loop
 1000 RTS
 1010 .ch20
 1020 LDA #0
 1030 STA pointer%
 1040 TAX
 1050 LDA #&30
 1060 STA pointer%+1
 1070 .loop2
 1080 LDA (pointer%,X)
 1090 AND #63
 1100 TAY
 1110 LDA even20%,Y
 1120 STA (pointer%,X)
 1130 INC pointer%
 1140 LDA (pointer%,X)
 1150 AND #63
 1160 TAY
 1170 LDA odd20%,Y
 1180 STA (pointer%,X)
 1190 INC pointer%
 1200 BNE loop2
 1210 INC pointer%+1
 1220 BPL loop2
 1230 RTS
 1240 .ch21
 1250 LDA #0
 1260 STA pointer%
 1270 TAX
 1280 LDA #&30
 1290 STA pointer%+1
```

Continued ►

◀ Wilkes' listing 1 continued

```
1300 .loop1
1310 LDA (pointer%,X)
1320 AND #63
1330 TAY
1340 LDA even21%,Y
1350 STA (pointer%,X)
1360 INC pointer%
1370 LDA (pointer%,X)
1380 AND #63
1390 TAY
1400 LDA odd21%,Y
1410 STA (pointer%,X)
1420 INC pointer%
1430 BNE loop1
1440 INC pointer%+1
1450 BPL loop1
1460 RTS
1470 ]
1480 ENDPROC
1490 :
1500 DEF PROCchecksum
1510 total%=0
1520 FOR i%=&1500 TO P%-1
1530 total%=total%+?i%
1540 NEXT i%
1550 IF total%<>14701 PRINT"Checksum error in assembler.":VDU7:END
1560 total%=0
1570 FOR i%=&1600 TO &18FF
1580 total%=total%+?i%
1590 NEXT i%
1600 IF total%<>104872 PRINT"Checksum error in tables.":VDU7:END
1610 ENDPROC
1620 :
1630 DEF PROCsave
1640 *SAVE CONVERT 1500 1900
1650 ENDPROC
```

Listing 2. Demonstration of Mode Convertor

```
10 REM Mode Convertor listing 2
20 REM by Phil Wilkes
30 REM B/B+/M/E
40 REM (c) Acorn User October 1986
50 :
60 PROCinit
70 MODE2:REM set original mode
80 *LOAD TESTPIC
90 get%=GET
100 MODE 1:REM set new mode
110 *LOAD TESTPIC
120 PROCconvert21
130 get%=GET
140 MODE 0:REM set new mode
150 *LOAD TESTPIC
160 PROCconvert20
170 END
180 :
190 DEF PROCinit
200 *LOAD CONVERT
210 ch10%=&1500
220 ch20%=&1524
230 ch21%=&154C
240 ENDPROC
```

Continued ▶

◀ Continued

```
250 :
260 DEF PROCconvert10
270 CALLch10%
280 ENDPROC
290 :
300 DEF PROCconvert20
310 CALLch20%
320 ENDPROC
330 :
340 DEF PROCconvert21
350 CALLch21%
360 ENDPROC
```

Listing 3. Draws a demonstration Mode 2 screen

```
10 REM Mode Convertor listing 3
20 REM by David Lawrence
30 REM B/B+/M/E
40 REM (c) Acorn User October 1986
50 :
60 MODE2
70 PROCdrawscreen
80 PROCsave
90 END
100 :
110 DEF PROCdrawscreen
120 VDU23;8202;0;0;0;
130 colour%=1
140 FOR ang%=0 TO 360 STEP 5
150 MOVE 640,512:GCOL 0,colour%
160 DRAW 640+1000*SINRAD(ang%),512+1000*COSRAD(ang%)
170 colour%=colour%+1
180 IF colour%=8 colour%=1
190 NEXT
200 colour%=7
210 FOR rad%=500 TO 0 STEP -25
220 PROCcirc(640,512,rad%,colour%)
230 colour%=colour%-1
240 IF colour%<0 colour%=7
250 NEXT
260 PROCtext(30,800,"Acorn",0)
270 PROCtext(10,780,"Acorn",2)
280 PROCtext(170,550,"User",0)
290 PROCtext(150,530,"User",1)
300 ENDPROC
310 :
320 DEF PROCsave
330 *SAVE "TESTPIC" 3000+5000
340 ENDPROC
350 :
360 DEF PROCcirc(x%,y%,r%,col%)
370 MOVE x%,y%+r%:GCOL 0,col%
380 FOR ang%=0 TO 360 STEP 20
390 MOVE x%,y%
400 PLOT 85,x%+r%*SINRAD(ang%),y%+r%*COSRAD(ang%)
410 NEXT
420 ENDPROC
430 :
440 DEF PROCtext(x%,y%,a$,col%)
450 GCOL0,col%:VDU 5
460 VDU23,128,240,240,240,240,0,0,0,0
470 FOR char%=1 TO LEN(a$)
480 ?&900=ASC(MID$(a$,char%,1))
```

Continued ▶

◀ Wilkes' listing 3 continued

```
  490 X%=0:Y%=9:A%=&A:CALL &FFF1
  500 FOR b%=1 TO 8:FOR c%=7 TO 0 STEP -
1
  510 IF b%?&900 AND 2^c% MOVE x%+(char%
-1)*256+(7-c%)*32,y%+(9-b%)*16:VDU 128
  520 NEXT:NEXT:NEXT:VDU 4
  530 ENDPROC
```

See Spider Power, page 93

Listing 1. It uses EVAL to solve an equation

```
   10 REM Equation Solver
   20 REM using Newton's Method
   30 REM by  David Deutsch
   40 REM and David Johnson-Davies
   50 REM for BBC B/B+/M/E
   60 REM (c) Acorn User October 1986
   70 :
   80 INPUT "Equation to solve for X: "g
$
   90 E%=INSTR(g$,"=")
  100 f$="("+LEFT$(g$,E%-1)+") - ("+MID$
(g$,E%+1)+")"
  110 INPUT "Estimated solution: X = "v
  120 INPUT "Desired accuracy in X = "ac
curacy
  130 :
  140 GOTO 190:REM and return here
  150 PRINT'"Solution found near X = ";z
  160 ON ERROR OFF
  170 END
  180 :
  190 REM 'Subroutine' to find solution
  200 oldX=v
  210 a=accuracy/10
  220 ON ERROR GOTO 320
  230 X=v:fx=EVAL(f$)
  240 X=v-a:fm=EVAL(f$)
  250 X=v+a:fp=EVAL(f$)
  260 IF fp=fm THEN a=2*a:GOTO240
  270 newX=v-(fp+fm)*a/(fp-fm)
  280 ON ERROR OFF
  290 IF ABS(newX-v)<=accuracy THEN z=ne
wX:GOTO 150
  300 oldX=v:v=newX:GOTO210
  310 :
  320 REM Error handler
  330 IF ERR=17 THEN END
  340 IF ERL<>190 THEN a=a/2:GOTO240
  350 IF X=oldX THEN PRINT"Function unde
fined at given point":GOTO80
  360 v=.5*(v+oldX):GOTO 230
  370 a=a/2:GOTO240
```

Listing 2. Graph drawing program using more than one variable

```
   10 REM Spider Curve Drawing Program
   20 REM by  David Deutsch
   30 REM and David Johnson-Davies
   40 REM for BBC B/B+/M/E
```

Continued ▶

◀ Continued

```
   50 REM (c) Acorn User October 1986
   60 :
   70 MODE 1:xpix=4:ypix=4:COLOUR 1
   80 VDU 19,1,7;0;: VDU 19,2,7;0;: VDU
19,3,1;0;
   90 point=69:line=5:@%=0
  100 any_r=FALSE:any_t=FALSE
  110 PRINT"Equation for the curve in te
rms of"
  120 PRINT"any of the following"
  130 PRINT"X = horizontal Cartesian coo
rdinate,"
  140 PRINT"Y = vertical Cartesian coord
inate,"
  150 PRINT"r = radial polar coordinate,
"
  160 PRINT"t = angular polar coordinate
,"
  170 INPUT''g$
  180 E%=INSTR(g$,"=")
  190 f$="("+LEFT$(g$,E%-1)+") - ("+MID$
(g$,E%+1)+")"
  200 :
  210 PRINT '"Position of window:"
  220 INPUT"X-coordinate of left edge: "
l$
  230 xl=EVAL(l$)
  240 INPUT"X-coordinate of right edge:
"u$
  250 xr=EVAL(u$)
  260 INPUT"Y-coordinate of lower edge:
"l$
  270 yl=EVAL(l$)
  280 INPUT"Y-coordinate of upper edge:
"u$
  290 yu=EVAL(u$)
  300 xd=xr-xl:yd=yu-yl
  310 :
  320 REM axes at (0,0) or (xl,yl)
  330 IF xl>0 OR xr<0 THEN xa=xl ELSE xa
=0
  340 IF yl>0 OR yu<0 THEN ya=yl ELSE ya
=0
  350 colour=1 :REM curve
  360 acolour=3 :REM axes and dots
  370 :
  380 REM Polar Coordinates
  390 any_r= INSTR(g$,"r")<>0
  400 any_t= INSTR(g$,"t")<>0
  410 l$="0":u$="0"
  420 IF any_t PROCtrange
  430 lowt=EVAL(l$)-0.1:hight=EVAL(u$)+0
.1
  440 sheetsize=5
  450 :
  460 REM Scanning Increments
  470 epsilon=0.1:xs=xd/8: ys=yd/6
  480 arc=2
  490 :
  500 REM Start plotting
  510 CLG
  520 dy=epsilon*yd/256:dx=epsilon*xd/32
0
  530 :
  540 REM Scan Cells for Parts of the Cu
rve
  550 xscan=xl+.5*xs
```

Continued ▶

◀ **Johnson-Davies' listing 2 continued**

```
560 IF any_t xscan=xscan+dx*(hight-low
t)/(2*PI)
570 yscan=yl+.5*ys
580 ns=20
590 X=xscan:Y=yscan
600 closer_ret=1:GOTO940
610 ON result GOTO 630,730,780
620 :
630 REM Plot Point on Curve and Move A
long it
640 style=point:plot_ret=1:GOTO 1140
650 style=line:xx=X:yy=Y:hits=0:sense=
1
660 follow_ret=1:GOTO 1240
670 X=xx:Y=yy:style=point:plot_ret=2:G
OTO 1140
680 style=line:hits=0:sense=-1
690 follow_ret=2:GOTO 1240
700 GOTO780
710 :
720 REM Look Harder for Curve
730 X%=FNx(X):Y%=FNy(Y)
740 GCOL 3,3: PLOT point,X%,Y%
750 IF ABS(X-xscan)>xs OR ABS(Y-yscan)
>ys THEN 780
760 IF ns>0 THEN ns=ns-1:GOTO600
770 :
780 IF NOT any_t OR yscan>0 OR yscan+y
s<0 THEN yscan=yscan+ys ELSE yscan=yscan
+ys/3
790 IF yscan<yu THEN 580
800 IF NOT any_t OR xscan>0 OR xscan+x
s<0 THEN xscan=xscan+xs ELSE xscan=xscan
+xs/3
810 IF xscan<xr THEN 570
820 colour=3-colour
830 lowt=lowt+sheetsize
840 IF lowt<hight THEN 540
850 :
860 REM Draw Axes and Finish
870 GCOL 3,acolour:MOVE FNx(xa),0
880 PLOT 1,0,1023:MOV 0,FNy(ya):PLOT
1,1279,0
890 IF LEN(g$)<38 PRINTTAB(20-LEN(g$)/
2,31);g$;
900 REPEAT:UNTIL INKEY(-99)
910 *SAVE PLOT FFFF3000+5000
920 END
930 :
940 REM 'Closer' - Go Closer to Curve.
950 REM  result: 1=found curve, 2=not
found, 3=error
960 x=X:y=Y
970 result=3:ON ERROR IF ERR=17 THEN E
ND ELSE 1110
980 fx=FNeval(x,y)
990 IF fx=0 THEN result=1:GOTO1110
1000 fl=FNeval(x-dx,y)
1010 fr=FNeval(x+dx,y)
1020 fb=FNeval(x,y-dy)
1030 ft=FNeval(x,y+dy)
1040 IF ABS(SGN(fx)+SGN(fl)+SGN(fr)+SGN
(fb)+SGN(ft))<>5 result=1:GOTO1110
1050 IF ABS(fx)<.01*(ABS(fl)+ABS(fr)+AB
S(ft)+ABS(fb)) result=1:GOTO1110
1060 IF ABS(fr-fx)>ABS(fl-fx) THEN dfx=
(fr-fx)/dx ELSE dfx=(fx-fl)/dx
1070 IF ABS(ft-fx)>ABS(fb-fx) THEN dfy=
(ft-fx)/dy ELSE dfy=(fx-fb)/dy
```

Continued ▶

◀ **Continued**

```
1080 q=fx/(dfx*dfx+dfy*dfy)
1090 X=x-q*dfx:Y=y-q*dfy
1100 IF ABS(FNeval(X,Y)) < ABS(fx) THEN
result=2
1110 ON ERROR OFF
1120 ON closer_ret GOTO 610,1330
1130 :
1140 REM 'Plot' - Plots Point or Line.
1150 REM result: 0=OK, 1=point already
there
1160 X%=FNx(X):Y%=FNy(Y):result=0
1170 FOR j=-1 TO 1:FOR k=-1 TO 1
1180 result=result-(POINT(X%+j*xpix,Y%+
k*ypix)=colour)
1190 NEXT:NEXT
1200 result=-(result>1)
1210 GCOL 0,colour:PLOT style,X%,Y%
1220 ON plot_ret GOTO 650,680,1380
1230 :
1240 REM 'Follow' - Follows Curve
1250 ON ERROR IF ERR=17 THEN END ELSE 1
400
1260 x=X:y=Y
1270 gx=FNeval(x,y+dy)-FNeval(x,y-dy)
1280 gy=FNeval(x-dx,y)-FNeval(x+dx,y)
1290 q=sense*SQR((gx/dx)*(gx/dx)+(gy/dy
)*(gy/dy))*epsilon/arc
1300 X=x-gx/q:Y=y-gy/q
1310 nn=20
1320 closer_ret=2:GOTO940
1330 IF result=1 THEN 1360
1340 nn=nn-1
1350 IF nn>0 THEN 1320 ELSE 1400
1360 IF X<xl OR X>xr OR Y<yl OR Y>yu TH
EN 1400
1370 plot_ret=3:GOTO1140
1380 style=line:hits=(hits+result)*resu
lt
1390 IF hits<=2 THEN 1260
1400 ON ERROR OFF
1410 ON follow_ret GOTO 670,700
1420 :
1430 REM Functions and Procedures
1440 :
1450 DEF FNeval(X,Y)
1460 LOCAL r,t
1470 IF any_r THEN r=SQR(X*X+Y*Y)
1480 IF NOT any_t THEN=EVAL(f$)
1490 IF X=0 THEN t=PI-SGN(Y)*PI/2
1500 IF X<0 THEN t=ATN(Y/X)+PI
1510 IF X>0 THEN t=ATN(Y/X)-(Y<0)*2*PI
1520 t=t-2*PI*INT((t-lowt)/(2*PI))
1530 IF ABS(t-lowt-PI)>3 ERROR
1540 =EVAL(f$)
1550 :
1560 DEF FNx(x)=1280*(x-xl)/xd
1570 DEF FNy(y)=1024*(y-yl)/yd
1580 :
1590 DEF PROCtrange
1600 PRINT''"Approximate range of the a
ngle t:"'
1610 INPUT"Lower bound: "l$
1620 INPUT"Upper bound: "u$
1630 ENDPROC
```

See Trapping errors on the side, page 102

Listing 1. Service ROM error example

```
  10 REM Service ROM error example
  20 REM by Steve Picton
  30 REM for BBC B/B+/M/E
  40 REM (c) Acorn User October 1986
  50 :
  60 resultlo=&70:resulthi=&71
  70 F%=&3000
  80 FOR pass=0 TO 3 STEP 3
  90 P%=&5000
 100 [OPT pass
 110 OPT FNequw(0)
 120 OPT FNequb(0)
 130 JMP service+F%
 140 OPT FNequb(&82)
 150 OPT FNequb(copy-&5000)
 160 OPT FNequb(1)
 170 :
 180 .title
 190 OPT FNequs("Error example")
 200 OPT FNequb(0)
 210 OPT FNequs("1.01")
 220 :
 230 .copy
 240 OPT FNequb(0)
 250 OPT FNequs("(C) S.Picton")
 260 OPT FNequb(0)
 270 :
 280 .service
 290 PHP
 300 PHA
 310 TXA
 320 PHA
 330 TYA
 340 PHA
 350 TSX
 360 LDA &103,X
 370 EOR #4
 380 BEQ rcode4
 390 :
 400 .exit
 410 PLA
 420 TAY
 430 PLA
 440 TAX
 450 PLA
 460 PLP
 470 RTS
 480 :
 490 .complete
 500 TSX
 510 LDA #0
 520 STA &103,X
 530 BEQ exit
 540 :
 550 .text
 560 OPT FNequs("MOVE")
 570 :
 580 .rcode4
 590 TAX
 600 :
 610 .loop
 620 LDA (&F2),Y
 630 AND #&DF
 640 CMP text+F%,X
 650 BNE exit
 660 INY
 670 INX
 680 CPX #4
```

Continued ▶

◀ Continued

```
 690 BNE loop
 700 LDA #0
 710 STA resultlo
 720 STA resulthi
 730 JSR spaceloop
 740 :
 750 .nextchar
 760 LDA (&F2),Y
 770 CMP #13
 780 BEQ complete
 790 CMP #ASC" "
 800 BEQ end
 810 CMP #ASC"0"
 820 BCC badnumber
 830 CMP #&3A
 840 BCC digit
 850 CMP #ASC"A"
 860 BCC badnumber
 870 CMP #ASC"G"
 880 BCS badnumber
 890 SBC #&36
 900 :
 910 .digit
 920 ASL A
 930 ASL A
 940 ASL A
 950 ASL A
 960 LDX #4
 970 :
 980 .roloop
 990 ASL A
1000 ROL resultlo
1010 ROL resulthi
1020 BCS toobig
1030 DEX
1040 BNE roloop
1050 INY
1060 BNE nextchar
1070 :
1080 .end
1090 JSR spaceloop
1100 CMP #13
1110 BEQ complete
1120 LDX #0
1130 BEQ skip1
1140 :
1150 .badnumber
1160 LDX #badnum-start
1170 BNE skip1
1180 :
1190 .toobig
1200 LDX #size-start
1210 :
1220 .skip1
1230 LDY #0
1240 STY &100
1250 :
1260 .copyloop
1270 LDA start+F%,X
1280 STA &101,Y
1290 BEQ done
1300 INX
1310 INY
1320 BNE copyloop
1330 :
1340 .done
1350 JMP &100
1360 :
```

Continued ▶

◀ Picton's listing 1 continued

```
1370 .start
1380 OPT FNequb(16)
1390 OPT FNequs("Syntax error")
1400 OPT FNequb(0)
1410 :
1420 .size
1430 OPT FNequb(20)
1440 OPT FNequs("Too big")
1450 OPT FNequb(0)
1460 :
1470 .badnum
1480 OPT FNequb(28)
1490 OPT FNequs("Bad Hex")
1500 OPT FNequb(0)
1510 :
1520 .loop2
1530 INY
1540 :
1550 .spaceloop
1560 LDA (&F2),Y
1570 CMP#ASC" "
1580 BEQ loop2
1590 RTS
1600 :
1610 ]
1620 NEXT pass
1630 sum=0
1640 FOR A%=&5000 TO P%-1
1650 sum=sum+?A%:NEXT A%
1660 IF sum<>&5C65 THEN GOTO 1850
1670 END
1680 :
1690 DEF FNequb(N)
1700 ?P%=N
1710 P%=P%+1
1720 =pass
1730 :
1740 DEF FNequw(N)
1750 ?P%=N MOD 256
1760 ?(P%+1)=N DIV 256
1770 P%=P%+2
1780 =pass
1790 :
1800 DEF FNequs(N$)
1810 $P%=N$
1820 P%=P%+LEN(N$)
1830 =pass
1840 :
1850 VDU 7:PRINT "Check listing"
```

Listing 2. Language ROM error example

```
10 REM Language ROM error example
20 REM by Steve Picton
30 REM for BBC B/B+/M/E
40 REM (c) Acorn User October 1986
50 :
60 osrdch=&FFE0:buffer=&3000
70 veclo=&202:vechi=&203
80 F%=&3000
90 FOR pass=0 TO 3 STEP 3
100 P%=&5000
110 [OPT pass
120 JMP language+F%
```

Continued ▶

◀ Continued

```
130 JMP service+F%
140 OPT FNequb(&C2)
150 OPT FNequb(copy-&5000)
160 OPT FNequb(2)
170 :
180 .title
190 OPT FNequs("Error example")
200 OPT FNequb(0)
210 OPT FNequs("1.02")
220 :
230 .copy
240 OPT FNequb(0)
250 OPT FNequs("(C) S.Picton")
260 OPT FNequb(0)
270 :
280 .service
290 PHP
300 PHA
310 TXA
320 PHA
330 TYA
340 PHA
350 TSX
360 LDA &103,X
370 EOR #4
380 BEQ rcode4
390 :
400 .exit
410 PLA
420 TAY
430 PLA
440 TAX
450 PLA
460 PLP
470 RTS
480 :
490 .text
500 OPT FNequs("ERROR")
510 .rcode4
520 TAX
530 .loop
540 LDA (&F2),Y
550 AND #&DF
560 CMP text+F%,X
570 BNE exit
580 INY
590 INX
600 CPX #5
610 BNE loop
620 LDX &F4
630 LDA #142
640 JMP &FFF4
650 :
660 .language
670 LDA #(errorhandler+F%) DIV 256
680 STA vechi
690 LDA #(errorhandler+F%) MOD 256
700 STA veclo
710 :
720 .stackset
730 LDX #255
740 TXS
750 CLI
760 JSR &FFE7
770 :
780 .mainloop
790 LDA #ASC"?"
800 JSR &FFEE
810 JSR osrdch
```

Continued ▶

◀ Listing 2 continued

```
 820 BCS escape
 830 CMP #ASC"*"
 840 BEQ star
 850 CMP #ASC"0"
 860 BCC neither
 870 CMP #&3A
 880 BCC number
 890 CMP #ASC"A"
 900 BCC neither
 910 CMP #ASC"["
 920 BCC letter
 930 CMP #ASC"a"
 940 BCC neither
 950 CMP #ASC"{"
 960 BCS neither
 970 BCC letter
 980 :
 990 .star
1000 JSR &FFE7
1010 LDA #ASC"*"
1020 JSR &FFEE
1030 LDY #(paramblock+F%) DIV 256
1040 LDX #(paramblock+F%) MOD 256
1050 LDA #0
1060 JSR &FFF1
1070 BCS escape
1080 :
1090 LDY #buffer DIV 256
1100 LDX #buffer MOD 256
1110 JSR &FFF7
1120 JMP mainloop+F%
1130 :
1140 .escape
1150 LDA #126
1160 JSR &FFF4
1170 BRK
1180 OPT FNequb(1)
1190 OPT FNequs("Escape")
1200 OPT FNequb(0)
1210 :
1220 .number
1230 BRK
1240 OPT FNequb(2)
1250 OPT FNequs("Number")
1260 OPT FNequb(0)
1270 :
1280 .letter
1290 BRK
1300 OPT FNequb(3)
1310 OPT FNequs("Letter")
1320 OPT FNequb(0)
1330 :
1340 .neither
1350 BRK
1360 OPT FNequb(4)
1370 OPT FNequs("Neither")
1380 OPT FNequb(0)
1390 :
1400 .errorhandler
1410 LDY #1
1420 JSR &FFE7
1430 .loop
1440 LDA (&FD),Y
1450 BEQ end
1460 JSR &FFEE
1470 INY
1480 BNE loop
1490 .end
```

Continued ▶

◀ Continued

```
1500 JSR &FFE7
1510 JMP stackset+F%
1520 :
1530 .paramblock
1540 OPT FNequb(buffer MOD 256)
1550 OPT FNequb(buffer DIV 256)
1560 OPT FNequb(20)
1570 OPT FNequb(32)
1580 OPT FNequb(127)
1590 :
1600 ]
1610 NEXT pass
1620 sum=0
1630 FOR A%=&5000 TO P%-1
1640 sum=sum+?A% : NEXT A%
1650 IF sum<>&6DA5 THEN GOTO 1770
1660 END
1670 :
1680 DEF FNequb(N)
1690 ?P%=N
1700 P%=P%+1
1710 =pass
1720 :
1730 DEF FNequs(N$)
1740 $P%=N$
1750 P%=P%+LEN(N$)
1760 =pass
1770 VDU 7:PRINT "Check listing"
```

See Shall we talk?, page 161

Listing 1. Transmits the SYNC pulse around the Econet

```
 10 REM CONDUCT use WITH SYNC
 20 REM by Robin Newman
 30 REM idea by Dave Bisset
 40 REM for BBC B/B+/M/E + Econet
 50 REM (c) Acorn User October 1986
 60 :
 70 DIM txblk% 11:T%=10
 80 osbyte=&FFF4:osword=&FFF1
 90 REM set up tx control block
100 txblk%?0=&80
110 txblk%?1=&20
120 txblk%?2=&FF
130 txblk%?3=&FF
140 txblk%!4=0
150 txblk%!8=0
160 PROCtx
170 END
180 :
190 DEF PROCtx
200 REPEAT
210 A%=&10
220 X%=txblk% MOD 256
230 Y%=txblk% DIV 256
240 CALL osword
250 T%=T%-1
260 REPEAT
270 A%=&32
280 R%=USR(osbyte) AND &C000
290 UNTIL NOT (R% AND &8000)
300 UNTIL R%=0 OR T%=0
310 ENDPROC
```

Listing 2. Waits for the SYNC pulse before continuing

```
    0 REM SYNC use with CONDUCT
    1 REM by Robin Newman
    2 REM idea by Dave Bisset
    3 REM for BBC B/B+/M with Econet
    4 REM (c) Acorn User October 1986
    5 :
    6 ON ERROR ONERROR OFF:PROCdelblk(N%
):REPORT:PRINT"at line ";ERL:END
    7 osword=&FFF1:osbyte=&FFF4
    8 DIM blk%30, buffer%10
    9 PROCwait
   10 REM main program continues here
   20 :
   30 PRINT"Example program. Hello there
!":VDU7
   40 :
 9990 END
10000 DEF PROCwait
10010 REM set up rx control block
10020 blk%?1=&7F
10030 blk%?2=&20
10040 blk%?3=&0
10050 blk%?4=&0
10060 blk%!5=buffer%
10070 blk%!9=buffer%+8
10080 blk%?0=0
10090 X%=blk% MOD 256:Y%=blk% DIV 256
10100 A%=&11
10110 REM osword &11 "opens" receive blo
ck
10120 CALL &FFF1
10130 IF blk%?0=0 THEN PRINT "Can't open
 block":END
10140 Cbn%=blk%?0
10150 REM poll block until data received
10160 PROCpoll(Cbn%)
10170 REM delete block
10180 REM don't bother reading dummy dat
a
10190 PROCdelblk(Cbn%)
10200 REM sync pulse received
10210 ENDPROC
10220 :
10230 DEF PROCpoll(N%)
10240 REM osbyte &33 polls
10250 REM N% contains rx block number
10260 A%=&33:X%=N%
10270 R%=USR &FFF4
10280 Xreg%=R% AND &FF00
10290 REM poll till Xreg%=&8000
10300 IF Xreg%<>&8000 THEN GOTO 10260
10310 REM sync pulse received
10320 ENDPROC
10330 :
10340 DEF PROCdelblk(N%)
10350 REM deletes rx block held in N%
10360 A%=&34:X%=N%
10370 CALL &FFF4
10380 ENDPROC
```

Listing 3. Converts model B format function keys to Master

```
   10 REM Model B keys t
o Master
   20 REM by Robin Newma
n
   30 REM for BBC B/B+/M
 with Econet
   40 REM (c) Acorn User
   50 :
   60 DIM cli 40
   70 srckey=&70:destkey
=&72
   80 sortA=&74:sortB=&7
6
   90 FOR Z%=0 TO 3 STEP
 3
  100 P%=&A00
  110 [OPT Z%
  120 LDA &F4
  130 ORA #&80
  140 STA &F4
  150 STA &FE30
  160 LDY #&10
  170 :
  180 .clr
  190 LDA #&22
  200 STA &8000,Y
  210 LDA #&80
  220 STA &8011,Y
  230 DEY
  240 BPL clr
  250 JSR ptrshift
  260 LDA #&B
  270 STA srckey+1
  280 LDX #0
  290 :
  300 .nxt
  310 JSR findlen
  320 TAY
  330 CLC
  340 ADC &8000,X
  350 STA &8001,X
  360 LDA &B00,X
  370 CLC
  380 ADC #1
  390 STA srckey
  400 LDA &8000,X
  410 STA destkey
  420 LDA &8011,X
  430 STA destkey+1
  440 CPY #0
  450 BEQ nokey
  460 DEY
  470 :
  480 .shift
  490 LDA (srckey),Y
  500 STA (destkey),Y
  510 DEY
  520 BPL shift
  530 :
  540 .nokey
  550 INX
  560 CPX #16
  570 BNE nxt
  580 LDA &F4
  590 AND #&7F
  600 STA &F4
  610 STA &FE30
  620 RTS
  630 .ptrshift
  640 LDX #&10
  650 :
  660 .nxptr
  670 LDA &B00,X
  680 STA buf,X
  690 DEX
  700 BPL nxptr
  710 :
  720 .sort
  730 LDA #buf MOD 256
  740 STA sortA
  750 CLC
  760 ADC #1
  770 STA sortB
  780 LDA #buf DIV 256
  790 STA sortA+1
  800 ADC #0
  810 STA sortB+1
  820 LDX #&10
  830 STX len
  840 :
  850 .nxsort
  860 LDX len
  870 LDY #0
  880 STY flag
  890 :
  900 .sorloop
  910 LDA (sortB),Y
  920 CMP (sortA),Y
  930 BCS noswap
  940 PHA
  950 LDA (sortA),Y
  960 STA (sortB),Y
```

Continued ▶

◄ Listing 3 continued

```
 970 PLA
 980 STA (sortA),Y
 990 LDA #1
1000 STA flag
1010 :
1020 .noswap
1030 INY
1040 DEX
1050 BNE sorloop
1060 LDA flag
1070 BEQ sorexit
1080 DEC len
1090 BNE nxsort
1100 .sorexit
1110 RTS
1120 :
1130 .findlen
1140 LDA &B00,X
1150 STX flag
1160 LDX #&F
1170 :
1180 .nxtfind
1190 CMP buf,X
1200 BEQ found
1210 DEX
1220 BPL nxtfind
1230 :
1240 .found
1250 INX
1260 LDA buf,X
1270 LDX flag
1280 SEC
1290 SBC &B00,X
1300 RTS
1310 .flag
1320 OPT FNequb(0)
1330 .len
1340 OPT FNequb(0)
1350 .buf
1360 OPT FNequs(STRING$(17,CHR$0))
1370 ]
1380 NEXT
1390 PROCchecksum
1400 PRINT"Press SPACE BAR to save code ";
1410 REPEAT UNTIL GET=32
1420 A$="SAVE KBM A00 "+STR$~P%
1430 PROCcli(A$)
1440 PRINT'"Code saved as KBM"
1450 END
1460 :
1470 DEF PROCcli($cli)
1480 LOCAL X%,Y%
1490 X%=cli MOD 256
1500 Y%=cli DIV 256
1510 CALL &FFF7
1520 ENDPROC
1530 :
1540 DEF FNequb(D%)
1550 ?P%=D%
1560 P%=P%+1
1570 =Z%
1580 :
1590 DEF FNequs(A$)
1600 $P%=A$
1610 P%=P%+LEN(A$)
1620 =Z%
1630 :
1640 DEF PROCchecksum
1650 sum=0
1660 FOR X%=&A00 TO P%-1
1670 sum=sum+?X%
1680 NEXT
1690 IF sum<>&5888 PRINT"Checksum error:- check program":STOP
1700 ENDPROC
```

Listing 4. Converts Master format function keys to model B

```
>
  10 REM Master keys to Model B
  20 REM By Robin Newman
  30  REM for Master with Econet
  40 REM (c) Acorn User October 1986
  50 :
  60 DIM cli 40
  70 ptr1=&70
  80 ptr2=&72
  90 FOR Z%=0 TO 3 STEP 3
 100 P%=&A00
 110 [
 120 OPT Z%
 130 LDA &F4
 140 ORA #&80
 150 STA &F4
 160 STA &FE30
 170 LDA #&10
 180 LDY #0
 190 :
 200 .clr
 210 STA &B00,Y
 220 DEY
 230 BNE clr
 240 LDA #&B
 250 STA ptr2+1
 260 LDX #0
 270 :
 280 .nxt
 290 LDA &8001,X
 300 SEC
 310 SBC &8000,X
 320 TAY
 330 CLC
 340 ADC &B00,X
 350 STA &B01,X
 360 LDA &B00,X
 370 CLC
 380 ADC #1
 390 STA ptr2
 400 LDA &8000,X
 410 STA ptr1
 420 LDA &8011,X
 430 STA ptr1+1
 440 DEY
 450 :
 460 .shift
 470 LDA (ptr1),Y
 480 STA (ptr2),Y
 490 DEY
 500 BPL shift
 510 INX
 520 CPX #16
 530 BNE nxt
 540 LDX #0
 550 :
 560 .check
 570 LDA &B00,X
 580 CMP &B01,X
 590 BNE skip
 600 LDA &B10
 610 STA &B00,X
 620 :
 630 .skip
 640 INX
 650 CPX #15
 660 BNE check
 670 LDA &F4
 680 AND #&7F
 690 STA &F4
 700 STA &FE30
 710 RTS
 720 ]
 730 NEXT
 740 PROCchecksum
 750 PRINT"Press SPACE BAR to save code ";
 760 REPEAT UNTIL GET=32
 770 A$="SAVE KMB A00 "+STR$~P%
 780 PROCcli(A$)
 790 PRINT'"Code saved as KMB"
 800 END
 810 :
 820 DEF PROCcli($cli)
 830 LOCAL X%,Y%
 840 X%=cli MOD 256
 850 Y%=cli DIV 256
 860 CALL &FFF7
 870 ENDPROC
 880 :
 890 DEF PROCchecksum
 900 sum=0
 910 FOR X%=&A00 TO P%-1
 920 sum=sum+?X%
 930 NEXT
 940 IF sum <>&2D47 PRINT"Checksum error:-check program":STOP
 950 ENDPROC
```

Listing 5. Shifts user-defined characters from page &C00 to page &8F00

```
   10 REM Character defi
nition loader
   20 REM By Robin Newma
n
   30 REM for BBC Master
 + Econet
   40 REM (c) Acorn User
 October 1986
   50 :
   60 FOR Z%=0 TO 3 STEP
 3
   70 P%=&A00
   80 [OPT Z%
   90 \ set MSB in ROMSE
L to select RAM at &8000
  100 LDA &F4
  110 ORA #&80
  120 STA &FE30
  130 STA &F4
  140 LDY #0
  150 \ shift page &C to
&8F00
  160 .shift LDA &C00,Y
  170 STA &8F00,Y
  180 DEY
  190 BNE shift
  200 \ reset MSB in ROM
SEL to select ROMs at &8
000
  210 LDA &F4
  220 AND #&7F
  230 STA &F4
  240 STA &FE30
  250 RTS
  260 ]
  270 NEXT
  280 PRINT"Press SPACE
BAR to save the code ";
  290 REPEAT UNTIL GET =
32
  300 *SAVE shift A00 A1
E
  310 PRINT'"Code saved
as shift"
```

Top of the list

The Acorn User Gallery Disc *was a popular feature of the* Acorn User *stand at the AU show last July. Much comment was passed at the way in which graphics screens had been saved in a very compact form.*

The Screen Compactor program is very efficient, as proved by the fact that the 80 track version of the gallery disc *contains no less than 28 20k screens plus* Super Painter *and* Pixel Editor *– nearly 600k of information crammed into less than 200k of disc space!*

The compacting program, called SVPIC, is machine code and is a multi-pass compactor. In other words it will compact a graphics screen several times over until it makes a clean pass without compacting it any further. The compactor also saves the current mode value and the colour palette details – these are used by the loader program LDPIC to ensure that the program is loaded into the correct mode and that the colours are all correct.

Using SVPIC

You will need the screen picture you wish to compress and the SVPIC code on the same disc. If the screen is called CAN and is in mode 1 we could compress this with the following short program:

10 MODE 1
*20 *LOAD CAN 3000*
*30 *SVPIC CANNED*

Compression can take a few minutes so do be patient.

Using LDPIC

This is quite simple to use just ensure that the LDPIC code is on the same disc and enter:

**LDPIC CANNED*

assuming that CANNED is the name of the file to be loaded back in.

David Acton's Screen Loader program, LDPIC

```
   10 REM Screen Loader
   20 REM David Acton/Br
uce Smith
   30 REM BBC B/B+/M/Ele
ctron
   40 REM (c) Acorn User
 October 1986
   50 :
   60 PROCvars
   70 PROCassemble
   80 PROCchecksum
   90 *SAVE Ldpic 2E00 2
F35
  100 END
  110 :
  120 DEF PROCvars
  130 osbyte=&FFF4:osfin
d=&FFCE
  140 oswrch=&FFEE:osbge
t=&FFD7
  150 ENDPROC
  160 :
  170 DEF PROCassemble
  180 FOR pass=0 TO 3 ST
EP 3
  190 P%=&2E00
  200 [OPT pass
  210 LDA #&06
  220 CLC
  230 ADC &F2
  240 TAX
  250 LDA &F3
  260 ADC #&00
  270 TAY
  280 LDA #&40
  290 JSR osfind
  300 CMP #&00
  310 BNE noerror
  320 BRK
  330 ]
  340 ?P%=&D6:P%=P%+1
  350 $P%="No Screen Fil
e"
  360 P%=P%+LEN($P%)
  370 [OPT pass
  380 BRK
  390 .noerror
  400 STA &75
  410 LDA #&01
  420 STA &73
  430 LDX #&08
  440 JSR subroutine1
  450 STA &7A
  460 LDX #&08
  470 JSR subroutine1
  480 STA &7B
  490 LDA #&A0
  500 LDX #&55
  510 JSR osbyte
  520 TXA
  530 CMP &7B
  540 BEQ nochange
  550 LDA #&16
  560 JSR oswrch
  570 LDA &7B
  580 JSR oswrch
  590 LDX #&09
  600 .nextbyte
  610 LDA buffer,X
  620 JSR oswrch
  630 DEX
  640 BPL nextbyte
  650 .nochange
  660 LDA #&84
  670 LDX #&00
  680 LDY #&00
  690 JSR osbyte
  700 STX &7C
  710 STY &7D
  720 LDX #&0F
  730 .loop
  740 LDA #&13
  750 JSR oswrch
  760 TXA
  770 PHA
  780 JSR oswrch
  790 LDX #&04
  800 JSR subroutine1
  810 JSR oswrch
  820 LDA #&00
```

Continued ►

◄ **Continued**

```
  830 JSR oswrch
  840 JSR oswrch
  850 JSR oswrch
  860 PLA
  870 TAX
  880 DEX
  890 BPL loop
  900 LDX #&08
  910 JSR subroutine1
  920 STA &7E
  930 LDX #&08
  940 JSR subroutine1
  950 STA &88
  960 LDA &7E
  970 STA &7F
  980 .redo
  990 JSR swap
 1000 LDA &7F
 1010 SEC
 1020 SBC #&01
 1030 STA &70
 1040 .rightback
 1050 JSR subroutine2
 1060 BCC forward
 1070 LDX &88
 1080 JSR subroutine1
 1090 STA &77
 1100 LDX &7A
 1110 JSR subroutine1
 1120 STA &78
 1130 LDY #&00
 1140 .goback
 1150 LDA &78
 1160 STA (&70),Y
 1170 JSR addmove
 1180 DEC &77
 1190 BNE goback
 1200 JMP ahead
 1210 .forward
 1220 LDX &7A
 1230 JSR subroutine1
 1240 LDY #&00
 1250 STA (&70),Y
 1260 JSR addmove
 1270 .ahead
 1280 LDA &71
 1290 BPL rightback
 1300 DEC &7F
 1310 BEQ carryon
 1320 JMP redo
 1330 .carryon
 1340 LDA #&00
 1350 LDY &75
 1360 JMP osfind
 1370 .subroutine2
 1380 DEC &73
 1390 BNE noget
 1400 LDY &75
 1410 JSR osbget
 1420 STA &74
 1430 LDA #&08
 1440 STA &73
 1450 .noget
 1460 ASL &74
 1470 RTS
 1480 .subroutine1
 1490 STX &79
 1500 LDA #&08
 1510 SEC
 1520 SBC &79
 1530 STA &79
 1540 LDA #&00
 1550 STA &76
 1560 .nextbit
 1570 JSR subroutine2
 1580 ROR &76
 1590 DEX
 1600 BNE nextbit
 1610 LDX &79
 1620 BEQ return
 1630 .trynext
 1640 CLC
 1650 ROR &76
 1660 DEX
 1670 BNE trynext
 1680 .return
 1690 LDA &76
 1700 RTS
 1710 .swap
 1720 LDA &7C
 1730 STA &70
 1740 LDA &7D
 1750 STA &71
 1760 RTS
 1770 .addmove
 1780 LDA &70
 1790 CLC
 1800 ADC &7E
 1810 STA &70
 1820 LDA &71
 1830 ADC #&00
 1840 STA &71
 1850 RTS
 1860 .buffer
 1870 ]
 1880 NEXT
 1890 ENDPROC
 1900 :
 1910 DEF PROCchecksum
 1920 C%=0
 1930 FOR X%=&2E00 TO &2
F32
 1940 C%=C%+?X%
 1950 NEXT
 1960 IF C%=37790 THEN E
NDPROC
 1970 VDU 7
 1980 PRINT"Checksum err
or!"
 1990 STOP
```

SVPIC, the Screen Compressor listing

```
   10 REM Screen Compres
sor
   20 REM David Acton/Br
uce Smith
   30 REM BBC B/B+/M/E
   40 REM (C) Acorn User
 October 1986
   50 :
   60 PROCassemble
   70 PROCchecksum
   80 *SAVE SVPIC 2E00 2
FFF
   90 END
  100 :
  110 DEF PROCassemble
  120 FOR pass=0 TO 3 ST
EP 3
  130 P%=&2E00
  140 [OPT pass
  150 STY &84
  160 LDA #&01
  170 STA &83
  180 LDA #&02
  190 STA &82
  200 JSR writecat
  210 LDA #&00
  220 STA &83
  230 LDA #&FF
  240 STA &86
  250 STA &87
  260 LDA #&01
  270 STA &82
  280 .restart
  290 LDA #&02
  300 STA &88
  310 LDA #&03
  320 STA &79
  330 .redo
  340 LDA #&00
  350 STA &80
  360 STA &81
  370 JSR subone
  380 LDA &81
  390 CMP &87
  400 BCC forward10
  410 BNE roll
  420 LDA &80
  430 CMP &86
  440 BCS roll
  450 .forward10
  460 LDA &80
  470 STA &86
  480 LDA &81
  490 STA &87
  500 LDA &82
  510 STA &85
  520 LDA &88
  530 STA &89
  540 LDA &79
  550 STA &8A
  560 .roll
  570 SEC
  580 ROL &79
  590 INC &88
  600 LDA &88
  610 CMP #&09
```

Continued ►

◀ **Continued**

```
620 BNE redo
630 INC &82
640 LDA &82
650 CMP #&09
660 BNE restart
670 LDA #&01
680 STA &83
690 LDA &85
700 STA &82
710 LDX #&08
720 STX &73
730 JSR transfer
740 LDX #&08
750 LDA &89
760 STA &88
770 JSR transfer
780 LDA &8A
790 STA &79
800 JSR subone
810 JMP subtwo
820 .subone
830 LDA &82
840 STA &7E
850 SEC
860 SBC #&01
870 STA &7F
880 .doall
890 JSR copy
900 LDA &7F
910 STA &70
920 .allagain
930 LDY #&00
940 LDA (&70),Y
950 LDY &7E
960 CMP (&70),Y
970 BEQ over16
980 CLC
990 JSR subthree
1000 LDX &7A
1010 LDY #&00
1020 LDA (&70),Y
1030 JSR transfer
1040 JMP forward
1050 .over16
1060 STA &78
1070 LDY #&00
1080 STY &77
1081 .back11
1090 INC &77
1100 JSR addthem
1110 BMI setcarry
1120 LDA &77
1130 CMP &79
1140 BEQ setcarry
1150 LDA (&70),Y
1160 CMP &78
1170 BEQ back11
1180 .setcarry
1190 SEC
1200 JSR subthree
1210 LDA &77
1220 LDX &88
1230 JSR transfer
1240 LDA &78
1250 LDX &7A
1260 JSR transfer
1270 LDA &70
1280 SEC
1290 SBC &7E
1300 STA &70
1310 LDA &71
1320 SBC #&00
1330 STA &71
1340 .forward
1350 JSR addthem
1360 BPL allagain
1370 DEC &7F
1380 BPL doall
1390 RTS
1400 .subtwo
1410 LDX #&08
1420 LDA #&00
1430 JSR transfer
1440 LDA #&00
1450 LDY &75
1460 JMP &FFCE
1470 .subthree
1480 ROL &74
1490 DEC &73
1500 BNE return
1510 INC &80
1520 BNE nohigh
1530 INC &81
1540 .nohigh
1550 LDA &83
1560 BEQ noput
1570 LDY &75
1580 LDA &74
1590 JSR &FFD4
1600 .noput
1610 LDA #&08
1620 STA &73
1630 .return
1640 RTS
1650 .transfer
1660 LSR A
1670 PHA
1680 JSR subthree
1690 PLA
1700 DEX
1710 BNE transfer
1720 RTS
1730 .copy
1740 LDA &7C
1750 STA &70
1760 LDA &7D
1770 STA &71
1780 RTS
1790 .addthem
1800 LDA &70
1810 CLC
1820 ADC &7E
1830 STA &70
1840 LDA &71
1850 ADC #&00
1860 STA &71
1870 RTS
1880 .writecat
1890 LDA &84
1900 CLC
1910 ADC &F2
1920 TAX
1930 LDA &F3
1940 ADC #&00
1950 TAY
1960 LDA #&80
1970 JSR &FFCE
1980 STA &75
1990 LDA #&08
2000 STA &73
2010 LDA #&84
2020 LDX #&00
2030 LDY #&00
2040 JSR &FFF4
2050 STX &7C
2060 STY &7D
2070 JSR copy
2080 LDY #&00
2090 LDX #&01
2100 STX &7A
2110 STX &7F
2120 .back10
2130 STX &7E
2140 LDA &7A
2150 CMP (&70),Y
2160 BCS over8
2170 SEC
2180 ROL &7A
2190 INX
2200 BNE back10
2210 .over8
2220 JSR addthem
2230 BPL back10
2240 STX &7A
2250 LDX #&08
2260 LDA &7A
2270 JSR transfer
2280 LDX #&55
2290 LDY #&00
2300 LDA #&A0
2310 JSR &FFF4
2320 TXA
2330 LDX #&08
2340 JSR transfer
2350 LDX #&0F
2360 .back17
2370 TXA
2380 STA &8B
2390 PHA
2400 LDX #&8B
2410 LDY #&00
2420 LDA #&0B
2430 JSR &FFF1
2440 LDA &8C
2450 LDX #&04
2460 JSR transfer
2470 PLA
2480 TAX
2490 DEX
2500 BPL back17
2510 RTS
2520 ]
2530 NEXT
2540 ENDPROC
2550 :
2560 DEF PROCchecksum
2570 C%=0
2580 FOR X%=&900 TO &AA
E
2590 C%=C%+?X%
2600 NEXT
2610 IF C%=46068 THEN E
NDPROC
2620 VDU 7
2630 PRINT"Checksum err
or!"
2640 END
```

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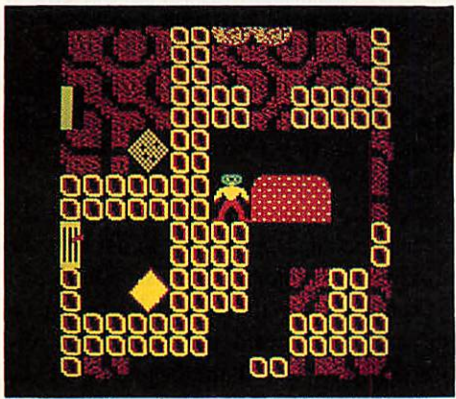
Check out the latest position of your favourite game

TOP 20 BBC MICRO GAMES

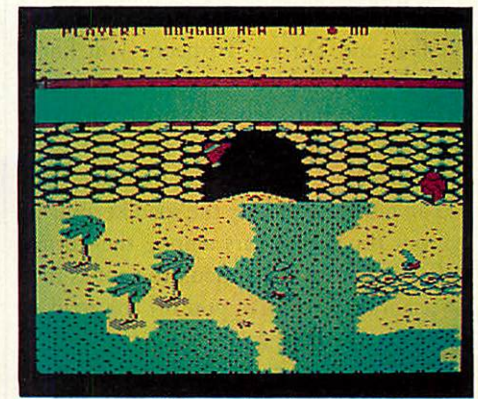
		Title	Publisher	Cassette	Disc	B+	Master	Reviewed
1	(–)	Thrust	Superior	£7.95	£11.95	Yes	Yes	–
2	(1)	Commando	Elite	£9.95	£14.95	Yes	Yes	August '86
3	(–)	Air Wolf	Elite	£9.95	£14.95	Yes	Yes	–
4	(20)	Ian Bothams Test Cricket	Tynesoft	£7.95	£11.95	Yes	Yes	–
5	(2)	Tennis	Bug-Byte	£2.99	–	Yes	Yes	September '86
6	(–)	Cricket	Bug-Byte	£2.99	–	Yes	Yes	–
7	(18)	Star Force 7	Bug-Byte	£2.99	–	Yes	Yes	October '86
8	(11)	Citadel	Superior	£9.95	£11.95	Yes	*	March '86
9	(–)	Way of the Exploding Fist	Melbourne House	£9.95	–	Yes*	Yes*	April '86
10	(3)	Winter Olympics	Tynesoft	£9.95	–	*	*	September '86
11	(15)	Repton 2	Superior	£9.95	£11.95	*	*	December '85
12	(–)	Waterloo	Lothlorien	£9.95	£12.95	Yes	Yes	April '86
13	(10)	Phantom Combat	Doctor Soft	£9.95	£11.95	Yes	Yes	February '86
14	(17)	Savage Pond	Bug-Byte	£2.99	–	*	*	September '86
15	(12)	Computer Hits 10 Volume 2	Beau Jolly	£9.95	–	Yes	No	July '86
16	(7)	Galactic Patrol	Mastertronic	£1.99	–	No	No	–
17	(5)	Karate Combat	Superior	£8.95	£11.95	No	No	July '86
18	(9)	Yie Ar Kung Fu	Imagine	£9.95	£12.95	Yes*	Yes*	March '86
19	(8)	Jet Set Willy	Tynesoft	£7.95	£9.95	Yes	Yes	–
20	(–)	Strike Force Harrier	Mirrorsoft	£9.95	£12.95	Yes	Yes*	January '86



Winter Olympics: Slips on the ice down to 10



Repton 2: Superior's game is still a bestseller



Commando: Still storming the chart at no. 2

TOP 10 ELECTRON GAMES

		Title	Publisher	Cassette	Disc	Reviewed
1	(1)	Galactic Patrol	Mastertronic	£1.99	–	–
2	(3)	Computer Hits 10 Volume 2	Beau Jolly	£9.95	–	July '86
3	(2)	Commando	Elite	£9.95	£14.95	August '86
4	(7)	Yie Ar Kung Fu	Imagine	£9.95	£12.95	March '86
5	(–)	Citadel	Superior	£9.95	£11.95	March '86
6	(–)	Cricket	Bug-Byte	£2.99	–	–
7	(–)	Star Drifter	Firebird	£3.95	–	–
8	(–)	Hulk	Americana	£2.99	–	–
9	(–)	Computer Hits 10	Beau Jolly	£9.95	–	July '86
10	(4)	Tennis	Bug-Byte	£2.99	–	September '86

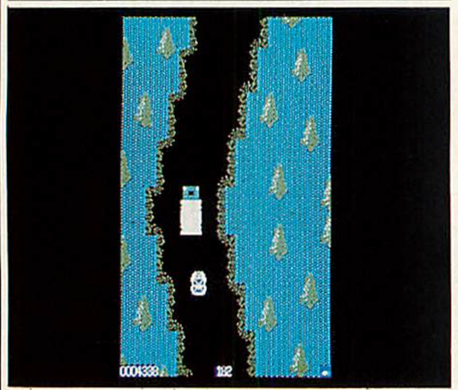
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REVIEWS

GAMES

LIVE AND LET DIE



'Spy Hunter', US Gold, BBC B, £9.99 (cassette), £14.99 (disc)

In *Spy Hunter*, you assume the role of a James Bond-style secret agent. Your mission is simply to keep your spy car on the road along which you are driving. Sounds easy? Well it would be, if it wasn't for the enemy cars. With names like The Enforcer, Switch Blade, Mad Bomber and Doctor Torpedo, you know you're in for trouble.

The action starts when a van drives up the road and your car is rolled out of the back. From here on in you are on your own!

You must drive along the road keeping an eye out for enemy cars among the normal traffic. They are not difficult to spot as they invariably try to force you off the road or alternatively, shoot you!

To assist you in combating the enemy threat, your car is initially equipped with forward-firing machine guns.

However, as the game progresses you can collect extra weaponry for your arsenal such as a missile launcher, an oil slick generator and a smoke screen.

As if this wasn't enough every now and again you get the chance to drive down a fork in the road to a boat house. Here your car changes instantly into a speed boat and the battle re-commences on water.

Spy Hunter is well designed with attractive graphics and reasonable sound. Keyboard response is also very good.

A unique feature of the game is that at any time pressing key f-0 causes the screen to toggle between a small high resolution display and a large low resolution one. One small criticism is that during loading, a high resolution title screen is loaded in directly from the tape. Although this title screen is very good it does increase the loading time of the already very long program.

Despite this small annoying point, *Spy Hunter* is a well presented thoroughly enjoyable game.

Mike Ginns

DOING BATTLE WITH WHO DUN PONG



'Woks', Artic Computing, BBC B/ Electron, £1.99 (cassette)

There often comes a point, when reading the description of a game, you know that the program itself is going to be disappointing.

Woks has a mercifully short description on the cassette inlay card, but a tortuously verbose introduction at the beginning of the game. Here you are told that the tyrant emperor Who Dun Pong (yes, I'm afraid so) has hidden a number of woks in strongrooms in the palace to stop his people getting fat.

As if you haven't already guessed, your job is to find the woks, avoiding the guards on the way. And it's a race against time, with bonus points for those who finish each screen quickly. This is all described for you in text that might amuse the very young, with its tedious swapping of Rs and Ls – but if I was Chinese I would find it insulting.

The game takes some time to load in, especially when you consider what you get at the end of it. The reason is probably all the dispensible text. Once you've read it you find there are still more files to be loaded.

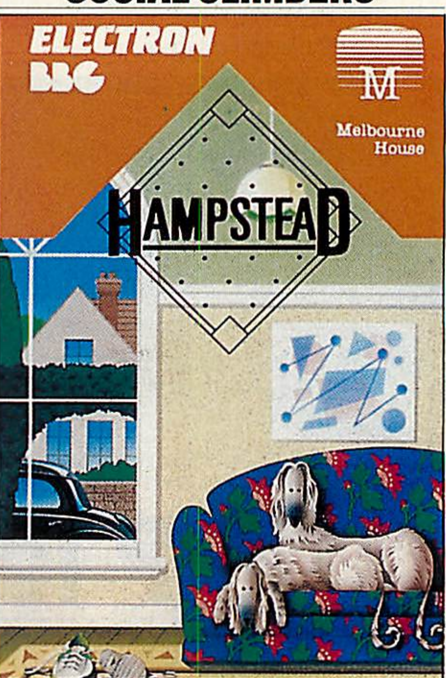
When finally you do get to it you're faced with yet another platform-type game. The graphics are hardly world-shattering but pretty enough. The movement of the figures I found a little jerky, however. Also the character you control does not respond particularly well to the keys.

While on the subject of keys, I found the choice rather cumbersome. Why isn't the player allowed to choose the keys?

In the end, I decided the people are better off without their woks. The emperor was probably right – all those greasy noodles are undoubtedly bad for them. Oh, and by the way, the game doesn't work on the Master.

Steve Mansfield

CALLING ALL SOCIAL CLIMBERS



'Hampstead', Melbourne House, BBC micro/Electron, £6.95 (cassette)

This is the game for all those people looking for a bit of relief from the nasty goblins, wizards and dungeons that are so often the standard fare of adventures.

In this text-only adventure there are no castles to assault or valleys to negotiate. The only climbing you have to do is the social type. The object of the game is not a simple

GAMES

one. Just getting to Hampstead isn't too difficult. The trick is to 'arrive', with all the success and status which that implies. You must become a Hampstead person!

Unfortunately, the programmers don't make life easy for you. You start off in a grisly apartment, knee deep in fungi and discarded take-away cartons, in a less salubrious area of north-east London.

Your first arduous task is to get dressed and out of the house without being mugged. Should you make the mistake of simply walking out the back gate you are tartly informed that you will never attain Hampstead status without transport.

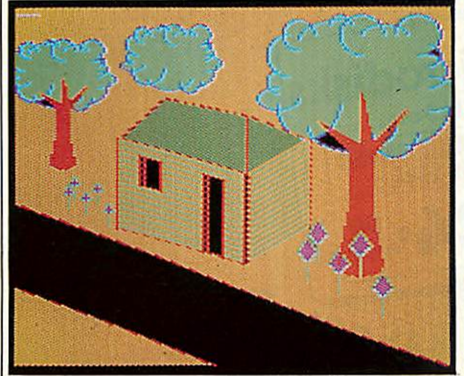
Next comes the marginally less awkward task of collecting your dole cheque and cashing it in. Along the way there are plenty of wonderfully corny jokes and all too realistic descriptions of modern London life. I especially liked the queue in the dole office which seems to take forever to move.

Everything about the game is unconventional. *Hampstead* is the only adventure I know with commands like Marry and Kiss. Furthermore, there aren't many adventures where a Sony Walkman is considered an essential object. You can lie, steal, cheat and defraud to get to NW3.

The scenario and the text are well up to Melbourne House's usual high standards.

Steve Mansfield

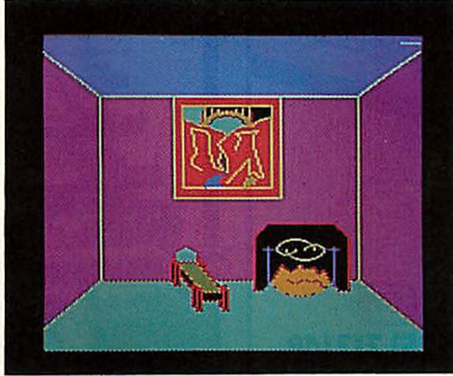
FROM HERE TO KINGDOM COME



'Twin Kingdom Valley', Bug Byte, BBC micro/Electron, £2.95 (cassette)

This is a traditional adventure game, set in a mythical valley in which reside, as you might have guessed, two kings, who aren't exactly on the best of terms.

You play the classic adventure stereotype – an adventurous, bounty hunting, greedy human. Survive long enough, and you'll discover 175 illustrated locations, and 35 creatures, each with its own current strength, maximum strength, carrying capacity, and unattractive personality. You've been set an objective, too, though it's only the rather unimaginative target of amassing 1024 points.



Helped, no doubt, by the low price tag, *Twin Kingdom Valley* seems to have already caught the imagination of many players, since I've come across hints and tips on the game in several software magazines. It's just as well, as without them and Bug Byte's own help sheet, I wouldn't have got far. To be honest, I still haven't got far!

I wish software houses would give an approximate level of difficulty for their adventures, to save baffling beginners and frustrating afficionados. Bug Byte haven't done so here, so I'll now declare that this game is difficult.

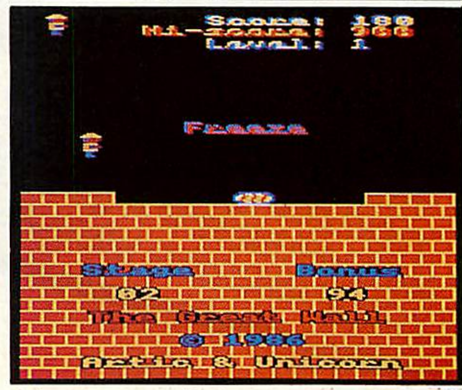
Two particular problems I encountered occurred at the beginning and the end of each game. I found it very hard to get going, and spent a lot of time wandering along forest paths, past endless babbling brooks, meeting just the odd unarmed gorilla. Then, when something dreadful happens, and I'm sent to meet my maker, I find there's no way of restarting without reloading the whole game. A surprising shortcoming in an otherwise sophisticated package.

Keyboard response is excellent. The program accepts anything from whole sentences to single letters, and responds quickly. Six display options, available throughout each game, determine if and when graphics are shown and the length of location descriptions, allowing players to customise the game to their style and experience.

I'd call this game a very attractively written challenge for the experienced adventurer.

Bernard Emblem

THE NOT SO GREAT WALL



'The Great Wall', Artic Computing Ltd, BBC B/Electron, £1.99 (cassette)

The Great Wall is a game set in days of old when battles raged and you as an army runner, are vital in keeping the communication lines open. At least that's what the game's inlay card tells you. In reality the game is an implementation of the popular *Hunch Back* game and a very poor one at that.

It is your job to guide the runner across the screen dealing with a variety of hazards such as rocks being hurled at you, battlements to jump over, pits to be got across and particularly vicious soldiers with sharp pikes!

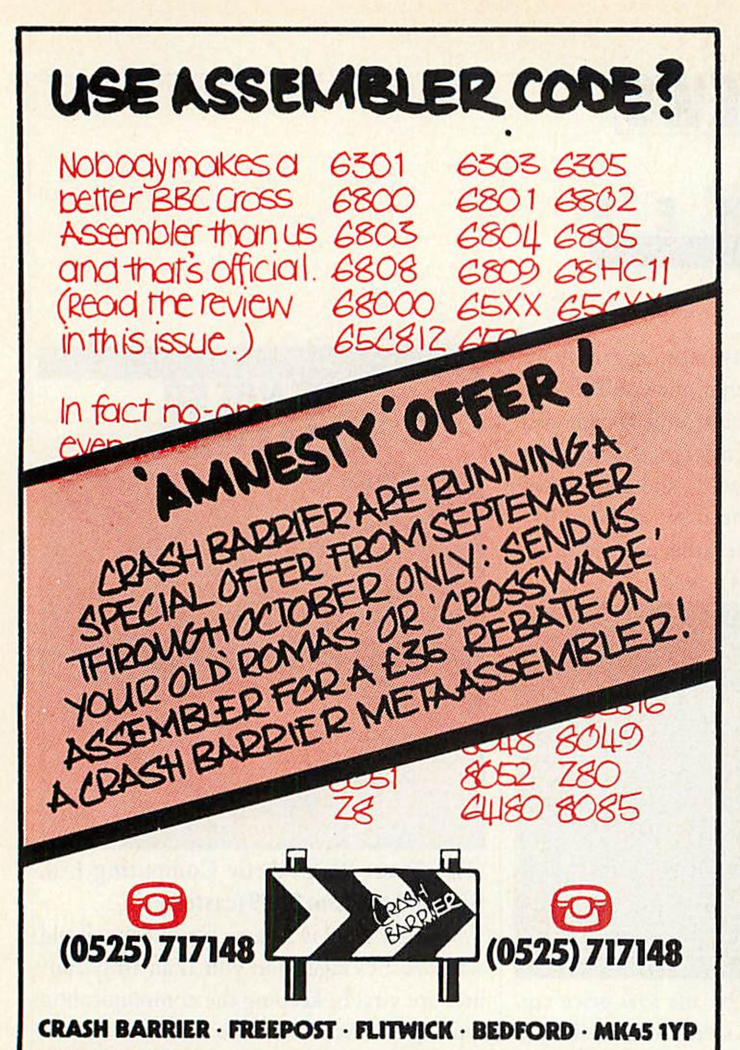
The game boasts eight skill levels each containing 64 of these sections – 512 sections in all – and a choice of four accompanying background tunes.

The game runs in screen mode five, restricting the display to just three colours on a black backdrop, giving rise to a very bland and boring background on which to play. The character animation is amateurish. Some of the game objects, particularly the rocks, move an entire character square at a time resulting in very jerky movement. Screen flicker is also evident.

The collison checking between screen objects leaves a great deal to be desired. I often thought I was a gonner only to discover the threatening nasty would pass straight through my character with no apparent ill effects. Conversely, on other occasions the mere presence of a rock some distance away brought on a premature attack of death.

This is the type of game that was around when the BBC was first launched and software was scarce. It is both unoriginal and poorly written and has very little to offer.

Mike Ginns



SINK THE BISMARCK

A WARGAME SIMULATING A MAJOR ACTION OF WORLD WAR II

'Sink The Bismarck' is the first of a new generation of wargames for the BBC Micro with a single disc-drive. The game is split into several sections, each of which is loaded as and when required by the main battle program. The game comprises some 40K of code, which still runs on a BBC B in hi-resolution graphics mode.

'Sink The Bismarck' is an accurate simulation of conditions in the North Atlantic in May 1941, including U-boats to harass your battleships, weather and fuel considerations, and troop and supply convoys which you must protect from the German battleship, which was regarded as the most powerful vessel afloat at the time. You have twelve British ships, each with their own strengths and weaknesses with which to scour the North Atlantic 1500 miles wide!

The program is compatible with the BBC B, B+64K, B+128K and MASTER 128 machines, and with the Acorn DFS, Watford DFS/DDFS, Opus DDOS, Solidisk DFS and the ADFS, and should be compatible with all other systems.



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ROMS

CROSSING THE DIVIDE

Simon Williams compares three cross assemblers

A cross assembler is a utility which allows you to write and assemble machine code. Unlike an ordinary assembler, however, a cross one lets you write code for a processor other than the one in your computer. You can't, of course, run the machine code without transferring it to a micro with the right processor, but if you only have limited access to the 'target' computer, a cross assembler allows you to do most of the development on one machine; in this case a BBC micro.

With the selection of cross assemblers under review here you could write code for a Master 128 (65C02), Spectrum or Amstrad (Z80), Dragon (6809) or Atari ST (68000), among many others.

```
1450  4FAF EC 88 05      CALL PE,NN
1460  4FB2 E4 88 05      CALL PO,NN
1470  4FB5 CC 88 05      CALL Z,NN
1480  4FB8 3F            CCF
1490  4FB9 BE            CP (HL)
1500  4FBA DD BE 05       CP (IX+IND)
1510  4FBD FD BE 05       CP (IY+IND)
1520  4FC0 BF            CP A
1530  4FC1 B8            CP B
1540  4FC2 B9            CP C
1550  4FC3 BA            CP D
1560  4FC4 BB            CP E
1570  4FC5 BC            CP H
1580  4FC6 BD            CP L
1590  4FC7 FE 20         CP N
1600  4FC9 ED A9         CPD
1610  4FCB ED B9         CPDR
1620  4FCD ED A1         CPI
1630  4FCF ED B1         CPIR
1640  4FD1 2F            CPL
1650  4FD2 27            DAA
1660  4FD3 35            DEC (HL)
1670  4FD4 DD 35 05      DEC (IX+IND)
1680  4FD7 FD 35 05      DEC (IY+IND)
1690  4FDA 3D            DEC A_
```

Assembling Z80 code from a BBC micro

Crossware

The *Crossware* package consists of a 16k ROM, utilities disc and thin manual. Each chip only caters for one processor family and works symbiotically with the resident Basic operating system. This means that you work in the normal 6502 assembler environment, but using instruction mnemonics for the new target processor, rather than the 6502. To tell the *Crossware* ROM what you're doing, you simply use the command *MCODE before starting your assembler program, rather than the usual opening square bracket.

The *Crossware* assembler can save sections of code to disc as Basic procedures, and will then supplement Basic's own search routine when a procedure is called from within a program. If the procedure isn't found in memory, *Crossware* will search for a file with the procedure's name in the 'P' library of the selected drive. If found, the code of the procedure is overlayed into memory, executed and then removed again.

The assembler supports disc-to-disc assembly, and offers the pseudo-operations OPT, EQUB, EQUW, EQUD and EQUS. It can handle code overlays, as described, as well as assembling from a contiguous section of program in memory.

Romas

This cross assembler copes with nine target processors, all eight bit, with three of the instruction sets included in the 16k ROM and the other six loaded as overlays from the supplied utilities disc. A 160-page A5 manual completes the package, and is clearly written, with most aspects of *Romas* operation covered with illustrative examples.

Romas provides its own, full-screen editor which works happily in any mode. Text lines can be up to 250 characters long, and the screen will scroll along them. The top four lines of the editor are used for commands and to display status information, the rest of the screen being devoted to the text of your program.

The editor commands are all of one or two characters and provide very comprehensive control of the cursor and text. I don't know when I've seen more copious movement and deletion commands.

The editor will also search your source text, replace sections either globally or selectively, and supports wild cards.

The editor will handle macros. This means that you can assign a string of commands to a particular key sequence and call those commands by pressing the relevant keys. It is very similar to the macros available with *View*, but should not be confused with a macro assembler, such as *Meta*. The *Romas* assembler offers 22 different directives, including conditional assembly via the IF, THEN and ELSE statements. Using these commands you can instruct the assembler only to assemble particular sections of code if certain conditions are met. This is very useful when you want to include test code for debugging your assembler program.

As well as the editor and assembler, *Romas* includes a number of extra facilities called with * commands. These include Intel standard file converters, a file locator, a cross referencer for your source code and simplified file transmission and reception commands for use with the RS423 port.

A 6502 disassembler is provided on disc to experiment with, both as a utility and as a piece of sample source code.

Meta

Crash Barrier's cross assembler is a very comprehensive beastie. It arrives as 24k of code in two ROMs, a disc and an A4 loose leaf file running to 54 pages. It copes with a staggering

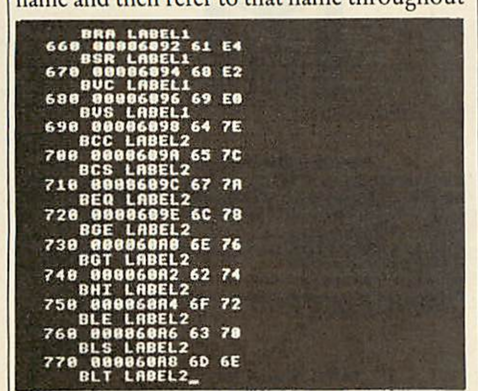
ROMS

17 different families of processor, including the 16 bit 68000. It's written in such a way that extra processors can be added to the list by incorporating their instruction sets into the assembler, so there's no reason why further 16 or 32 bit chips cannot be spliced in.

Meta's editor is a *Wordwise*-style mode 7 screen editor, which uses coloured highlighting to distinguish between assembler statements, comments and the current cursor line. It uses a clever technique of wrapping single lines of code around the 40 column screen so you can still work with long commented lines if you wish.

All the features you would expect to find in a good source code editor are present; byte count, search and replace, block movement. There are also a few extras, such as the ability to work in decimal or hex, and a comprehensive function evaluator which can be used in immediate mode as well as during assembly. You can also drop bars into your program to separate different sections of code, and move between them using the Find Bar function.

The *Meta* assembler supports modules, which are much like assembly-time macros. This means you can give sections of code a name and then refer to that name throughout



A BBC micro assembles 68000 code

your program. The assembler will then replace each occurrence of the name with the corresponding code segment. This is not the same as using sub-routines, as the finished program will be as long as it would without macros, but it does serve as a very useful shorthand and makes your source listings much more readable.

The assembler itself is selected from the editor's main menu and the directives supplied allow you to send the object code to disc, printer, user port, serial port, sideways RAM or to a Portal and in any of six processor formats. The whole system has a very professional feel. Another option from the main menu is a serial communicator. This subprogram deals with importing and exporting object code via the RS423 port, and offers handy functions like stripping out all control codes in an imported program, so they don't send your micro haywire.

Portal

All this cross-assembly is fine, but how do you get the assembled code from your micro, or its disc, into the target machine? There are various ways, most of which involve a serial connection between the two machines, but Crash Barrier's Portal is a particularly clever solution which, once fitted, allows code to be transferred freely from your BBC micro to the target machine.

A Portal consists of a dil header socket sandwiched between two small circuit boards. These boards hold a quantity of fast dynamic RAM and the necessary decoding circuitry to load the RAM with machine code from your BBC micro, via its user port. The dil socket is connected into any EPROM socket on the target machine and appears to that machine as one of its own EPROMs. Thus the code that you've written can be run immediately on the target machine, and updated from the BBC micro in a couple of seconds, if it needs to be altered.

Portals come in two configurations: the 128 and 512 models. The 128 can emulate 2716 (4k), 2732 (8k), 2764 (16k) and 27128 (32k) EPROMs, while the 512 can also imitate 27256 (64k) and 27512 (128k) chips. To anyone who does a lot of cross assembly, a Portal could stop an assembler being quite so cross!

When you are spoilt for choice, as in this case, you really have to decide what your exact requirements are. If you feel you're only ever likely to write for one other processor on your BBC micro, then you may well feel the single-target assemblers offered by Crossware are your best solution. They are certainly easy to use, with few new editing or assembly commands to learn. They do seem a bit on the expensive side, though.

Watford's *Romas* is a good all-rounder, offering a wide selection of eight bit target processors, a number of useful directives, and a macro editor which will work in both 40 and 80 column modes. The extra * commands provided will also be useful and the price of the complete package seems very competitive in my opinion.

Editor	Crossware	Romas	Meta
Facilities	3	5	4
Ease of use	3	3	5
Assembler			
Macros	Proc overlays	Editor only	Yes
No. of directives	5	22	35
Conditional assembly	No	Yes	Yes
No. of 8/16 bit families supported	6/1*	9/0	16/1+
Other features	2	4	5
Documentation	2	5	5

Key: *5 – very good; 4 – good; 3 – fair; 2 – poor; 1 – lousy*
**Each target processor on a separate ROM, + Designed to have extra instruction sets 'grafted on'*

Table-1. Comparative cross assembler features

The *Meta* assembler lives in a different world. It is structured to work with any new processor coming onto the market, as new instruction sets can be added as needed. It has a well-featured editor with colour highlighting, a sound modular approach to program creation and a useful serial communicator (like a sawn-off *Commstar*).

The Portal is an elegant solution to the problem of code transfer to the target machine, and although the overall price of the system may restrict its use to commercial or educational buyers, it must really be considered the state of the art.

'Z80XR/68000'XR', Crossware Products, 2 The Lawns, Melbourn, Royston, Herts SG8 6BA, Tel: (0763) 61539, £48/£56

'Romas', Watford Electronics, Jessa House, 250 Lower High Street, Watford, Herts, Tel: (0923) 37774, £51.75

'Meta', Crash Barrier, Freepost, Flitwick, Bedford MK45 1YP, Tel: (0525) 717148, £145

'Portal 128', Crash Barrier, both distributed by Technomatic, £100

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Three menus available, Load menu, Run menu, and Disk Free Space display. All Menus are mode 7 colour displays accessible using a * command, or more efficiently using L/Break, M/Break and O/Break.
Menus are 'networked', switch between them at the touch of a key.
Load menu loads BASIC programs and automatically lists them with page mode set on – with a single keystroke! However, if you have The Acorn BASIC Editor Rom in your machine, it is entered with insert mode set.
Load menu also loads machine code programs at the correct address for subsequent disassembly.
Automatically detects a Rom and prompts for a destination Ram socket.
Touch the COPY key and invoke the Copy menu. Select the files, select the target drive, and BEEBAID does the rest for you. Handles duplicate files, locked files and multiple destination drives.
The Run menu enables BASIC and machine code programs to be executed easily – by all the family! Supersedes all other well known Run menus – B, B+, Master and Tube compatible.
Disk Free Space Display shows the size of all files on a disk and the location of the free space. Touch a key to swap between hex and decimal. Hit 'C' for automatic compact.

*DISK FILE INDEXING SYSTEM

In addition to all the facilities already listed, the BEEBAID Rom is supplied with a Disk File Indexing system. This system automatically maintains an index of all your software and allows you to categorise your programs, eg. Games, Educational, Simulation etc. It can be dynamically tailored to your own requirements, eg. your disk drive configuration and which directories you want to index. The Index may be searched by program name, disk number or category. It is supplied on a 40/80 compatible disk with its own bound manual and it is FREE!

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SOFTWARE

SWIFT SPREADS ITS WINGS

Roger Carus puts the Swift spreadsheet through its paces

On first examination I thought that I was going to be enthusiastic about this spreadsheet as it has some unusual features which were welcome – notably a series of 'pop-up' menus which control functions; a split screen facility and some useful illustrative examples. However, not everything on this package lived up to expectations.

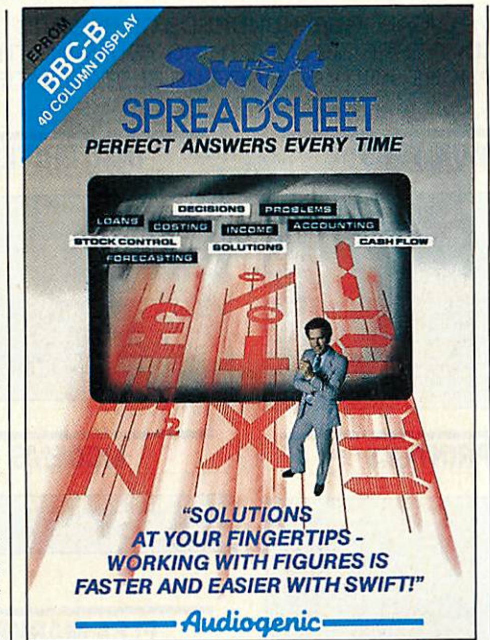
The package comes in the usual small box and is well presented. At the heart of the system is a 16k EPROM (version 2.2) which comes with a 52-page instruction manual, a plain cardboard reference card, advice on installation and a function key strip. The examples came in the form of a cassette with four 'templates' or typical sheets ready for use.

Fitting the EPROM was made more difficult by the fact that the adhesive label with the name had been wound right round the ends of the chip and it was difficult to be sure which end had the groove.

Then, like any proud new owner, I started to do some serious reading of the manual and discovered that it had been written for the Commodore 64, except for the frontsheet. There are several versions of the chip, designed for the Commodore and Atari ranges of micros. There are also separate versions for the BBC B offering 40 or 80 column screen displays. The version tested was the 40 column type which would be best for those who use a domestic TV rather than a monitor. I have no idea why the programmer did not allow a choice within one chip.

In actual operation there is very little to choose between different spreadsheets and the system of naming the cells in columns A to Z and rows 1 to 126 is standard. The actual number of boxes this produces is 3276 which is quite sufficient for most purposes and about as much as the memory will support. The entry of arithmetical instructions were the usual ones. The one thing about entries which I did not like, was the need to express the addition of two cells as +A1+B1 compared with the more normal A1+B1 used on most spreadsheets. The extra + is time consuming and unnecessary.

I very much liked the 'pop-up' menus which have not been available on any of the eight spreadsheets for the BBC micro which I have used. When using the sheet for constructing a model, at the touch of f5 a menu is superimposed on the screen without disturbing the calculations offering a choice of commands. So for example the main 'Command Menu' offers:



- Exit
- Range commands
- Worksheet commands
- Format cell
- Column-width
- Split screen
- Recalculation
- Disc commands
- Free space 10750 (the maximum).

You can then use the cursor to highlight your choice and bring up a sub menu on top of the first so as to get, for example the 'Worksheet Commands':

- Exit
- Global format
- Sheet column-width
- Delete row/col
- Insert row/col
- Save sheet
- Load sheet
- Printer set-up
- Change colour
- Formula or value
- Clear sheet

This can be repeated with a large number of sub menus which saves time and reduces mistakes made.

The other distinctive and excellent feature which the system offers is the ability to provide 'windows' by using the command 'Split Screen' and so either have headings fixed while data is entered or processed or even better to construct a window on a few key entries while working.

In fact I preferred this particular method to that used by *ViewSheet* which made it top choice in an earlier review.

My tests started by loading each of the examples provided from the cassette – and I wonder what proportion of users have still to change to discs? They ran beautifully and gave me a favourable impression of the package, although I think that overall entries may perhaps be a little bit slower to make – but nothing significant.

Then I tried two of the standard sheets that I use with each package to allow comparisons, and saved each to disc. Finally, I shut the system down, began again to load my sheets and obtained an 'Illegal Character' message! Thinking I had done something stupid I transferred the samples from cassette to disc and achieved the same result.

In fact mistakes were impossible as the system goes through the Command menu to the Worksheet menu, and then to 'Load' which shows up the current list of *Swift* files (in Directory 'G'), so mistakes are impossible. My problem lay in having a Watford Disc Filing System (DFS). It worked well on a more basic micro which uses an Acorn DFS. I still cannot understand it, because there are no characters other than 'G' and the file names consisted entirely of letters.

I understand that later production models of the chip will allow use by the Watford DFS.

This is a good package marred by a few faults which are unnecessary. For overall value, I give *Swift* five out of ten. If only Dave Middleton who wrote the program had tried out some of the earlier rivals and borrowed their best features!

Generally, a useful ROM-based system with some excellent features but be sure it is compatible with your DFS.

'Swift Spreadsheet', Audiogenic Software Ltd, 12 Chiltern Enterprise Centre, Station Road, Theale, Berkshire, Tel: (0734) 30366, BBC B with cassette or disc, £29.95



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BOOKS

REFER TO THE MASTER



'Master Reference Manual', Parts 1 & 2, £14.95 each

After I unpacked my Master I carried on looking around the box thinking that there must be a proper manual in there somewhere. Now I've got not one but two fairly decent manuals. The catch is that I had to fork out £15 for each of them.

Even so, they still don't cover two of the most important features of the Master, the *View* and *ViewSheet* programs built into the firmware. You're going to have to dip into your wallet to the tune of another £25 for that vital information.

It doesn't take a mathematical genius to work out that the real cost of a Master is not £500 but £555. It's true that some Master owners won't want the technical information in the reference manuals. Some may already have manuals for the firmware, having bought it for Beebs they already own, and some may never use *ViewSheet*.

Beeb owners, however, are pretty serious about their machines and usually want to get the most out of them. Acorn has given us a sophisticated machine and then offered to tell us how to use it – at a price.

The catch is that, for some time at least, you won't be able to get the information held in the reference manuals anywhere else. There are important differences between the Master and the Beeb at all levels, from Basic down to the operating system. You can't simply get one of the plethora of detailed books about the Beeb and hope that the information holds good for the Master.

Perversely, the *Reference Manual Part Two* came out first. It is mainly concerned with Basic programming, with sections covering all aspects of BBC Basic – from keywords to error messages. In that respect it is reminiscent of the User Guide, but goes further, with detailed information on how Basic uses memory and the MOS.

The Basic keyword section is possibly the most heavily used part of the manual by beginners and even some advanced programmers. All the information is here, including syntax and examples. However, unlike the User Guide, each keyword is not given a separate page. In addition the text fonts used don't really highlight each command, so finding the one you want is a slow business.

The assembler is covered in a similarly exhaustive way. Each keyword available with the 65C12 in the Master is described along with descriptions of flags affected and addressing modes available.

The other two sections of the Part Two manual cover the built-in Edit program and the terminal emulator. The former turns out to be very versatile indeed, with sophisticated formatting commands – something not even hinted at in the Welcome Guide.

As well as its use for editing Basic programs and other languages like Pascal, the edit program is a flexible wordprocessor. The manual does it justice, with clear descriptions of all the features.

The section on the Terminal program is less useful. The program is fairly crude. Although it can prove adequate for communicating with peripherals, like the Scorpion robot controller, anyone wanting to get into comms will need something else. The manual is pretty exhaustive though; it includes a great deal of detailed information on escape codes and sequences.

All that aside, it's the *Reference Manual Part One* that most people will have been dying to get their hands on (apart from the mythical *Advanced Reference Manual*).

Part One gives the lowdown on the MOS and filing systems, including details on all the OS calls. Osbyte, Osword and VDU commands are given a detailed treatment similar to that meted out to Basic keywords in the other volume.

A general chapter on the filing systems is followed by specific chapters on the cassette, ROM and disc systems in the Master. The latter covers both DFS and ADFS, and all chapters include a section on using the filing systems from assembly language.

The style is familiar from the old BBC User Guide, although this time Acorn has adopted a cumbersome page numbering system. It works well enough when you are simply looking for a general section. But finding a specific page mentioned in the index is slower than if ordinary page numbers had been used.

The manuals are about the size of the User Guide and they suffer from a similar binding problem. After about a week's ordinary use the pages start to work their way off the ring binding, so the manual never closes properly after that.

Between them the two guides cover the same sort of ground that the User Guide and *Advanced User Guide* did with the Beeb. However, most of this information should have come free with the machine.

Steve Mansfield

HEAD START FOR HACKERS

'The New Hacker's Handbook', Hugo Cornwall, Century, £6.95

Last year one slim paperback caused quite a stir in the computing fraternity. *The Hacker's Handbook* provided much-needed information to those micro users equipped with a modem who were wanting a little more excitement than the likes of Prestel and a few bulletin boards could offer.

The author defines 'hacking' as the recreational and educational sport of attempting to make unauthorised entry to computers and to explore what is there. The handbook will not dictate to you how to go about this. That cannot be done as it is an interactive process which changes from machine to machine and even day to day. Instead, the book will point you in a few worthwhile directions and suggest a few methods.

The handbook is a strange blend of the very basic and the quite advanced. In the first chapter, and in the appendices, the fundamentals of communications are covered – all those confusing baud rates, parity bits, duplex, PSS, protocols, and so on are spelt out in detail. In later chapters the secrets of viewdata and mainframe networks are discussed with an eye to invasion.

It's not just communication over the telephone that is covered. Methods of hacking by radio, and even hacking the telephone system itself, are revealed.

The whole subject of hacking has received some notoriety in the year since the first edition, with countless newspaper stories and films suggesting that hacking is an easy business requiring only a micro, a modem, and a book such as this. The truth is that you have to be long-dedicated to this essentially useless pursuit to succeed at all. If you are willing to so dedicate your machine, time, and patience, then this book will give you an invaluable head start.

Geoff Bains

HARDWARE

IMPROVE YOUR MEMORY

The Multiform Z80 second processor is probably the most flexible currently available. Ed Brown explains why

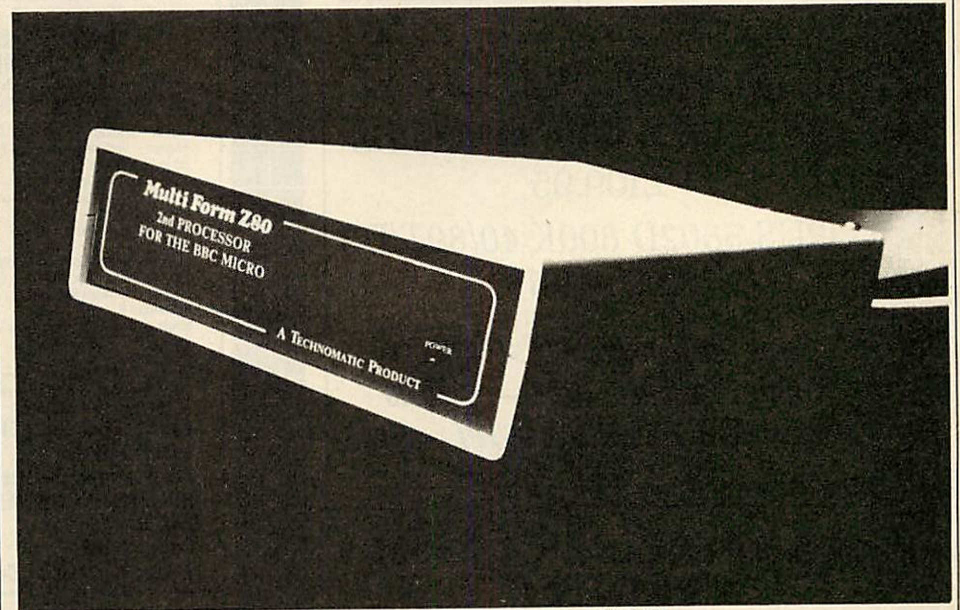
The latest addition to the Z80 second processor field is an offering from Technomatic aimed at those who have previously used CP/M. This Multiformat Z80 second processor overcomes the major criticisms of other Z80s by providing several disc formats that the user can select at will. In addition it is possible to add further formats as they are required, thus providing a very flexible and powerful system.

Until now it has been necessary to obtain software for Z80 second processors on their individual format of disc and then to install the software to handle the BBC micro screen control codes. Now by using the Multiformat Z80 these problems are a thing of the past. With a library of 28 formats (growing all the time) and three different screen emulations, together with the ability to read Torch format discs, the package is probably the most flexible currently available. Already an optional software package is being offered for reading and writing IBM PC format discs.

The package consists of a Z80 second processor and 64k of memory which is attached through the 1 MHz bus, a ROM chip, two discs and a manual. Its operating system is OSM, a CP/M look-alike, and as far as I can tell it is fully compatible with CP/M. When testing for compatibility I ran several programs ranging from the classics such as *Pocket Wordstar*, and the other Micropro products (kindly supplied by BEL), through to disc editing programs and communications software, and they all ran correctly. When ordering it is necessary to specify the type of filing system you are using, as the ROM chips for each system are different.

Full and clear instructions are given on inserting the ROM. The hardest task was removing the screws on the BBC micro casing. Once fitted, the *HELP command shows the presence of the ROM and the system can be booted up by typing *Z801 (the last digit determines the type of Disc Filing System that is fitted to the Beeb).

The system consists of the operating system, OSM, and the utilities PIP, STAT, SUBMIT, XSUB, ACCESS, BSTAR, SCOPY, DISPLAY, RS423, TORCHRW, and FORMAT. In addition there is the ROM-based



Technomatics's Multiform Z80: aimed at previous users of CP/M

multiformat software that comes into effect when the system is booted up with the *Z801D command. On typing *Z801D the system presents a menu of options on the screen which allows you to define the mode of operation of the system. Although this sounds complicated it is in fact simple. The seven options available from the main menu are described below with some short notes on what they accomplish.

Three terminal emulations are available on the system and these can be selected from this option on the menu. The emulations available are for the popular ADM3A and Hazletine 1500 and the BBC VDU in mode 3. This means that it is easy to install standard packages such as *Pocket Wordstar* for the Technomatic Z80 as these support either or both of these terminals. The option of BBC VDU mode 3 allows most programs to run that have been installed for the Acorn. The Display program under OSM allows the same selection of terminal emulations.

You can select which disc format you want for each drive by using the Read parameters option from library file option. This is done by first specifying which library you want to select from, and then by selecting a format from those presented on the menu. The package comes supplied with a number of formats, including Acorn, Superbrain and Amstrad, in a file called General. Other formats and libraries can be created by using option 3.

The add/define parameters option allows you to define your own formats for discs you want to read or write but which are not already included in a library. The method of doing this is to answer a series of questions about the format you wish to read or write. To do this you will need to know details such as the number of tracks, the sectors per track, density, number of directory entries, number of skipped tracks and the skew factor. Most of this information can be obtained from STAT together with a little educated guesswork. The other option is to sit down and systematically work through the different combinations until you find the one that is right for the disc you are trying to access. But you cannot examine the formats already described to see if any match up to the format you want.

You can remove a format from a library by using the option, delete entry in library. First, specify the library and then select the format from the menu. Once selected you are asked to confirm that you wish to remove the library. Similarly, you can create a new library to add additional formats.

The format disc option allows formatting a disc in the format selected for the drive speci-

fied. The same operation is carried out by the 'Format' program that runs under the OSM.

The Exit option allows you to boot the OSM operating system or enter any * commands to configure the system before booting OSM. Once you have selected the disc format and terminal emulation you require then you exit the menu by using the Exit option. Now the disc formats to be displayed will be shown and if these are correct, the system is booted by typing Return. Once in the system the following commands are available: PIP, STAT, SUBMIT and XSUB are equivalent to their CP/M counterparts but provide a better idea of what is happening.

You can transfer programs between the BBC DFS and OSM using the 'Access' program. This provides an easy method of utilising the files previously created under the BBC micro DFS.

BSTAR allows * commands to be accessed from OSM and is useful for setting up the function keys from within a Submit file for different programs.

The SCOPY program is provided to allow for the copying of discs when only a single drive is available. Since OSM is provided in RAM it is possible to run the whole system with only a single drive.

The terminal emulations can be selection via the 'Display' program. The default emulation is the ADM3A emulation.

RS423 is a flexible program that allows the setting of all the necessary values for communications through the RS423 channel.

TORCHRW primarily provides for the reading and writing of Torch format discs but also gives format and examination facilities. All the facilities are easily accessible from the menu displayed when the program starts up. And there is a separate program to perform similar functions (including reading and writing) on PCDOS format discs.

Format allows the formatting of a disc in the format selected for the drive. Torch and PCDOS format discs are dealt with using separate programs. Format is similar to the format disc option on the start up menu.

Technomatic's Multiform Z80 second processor is a very useful package which allows the use of many different disc formats, something that is normally only found on machines costing thousands of pounds. Although it does not use CP/M, the OSM operating system which is in ROM seems to be completely compatible with CP/M. A wide selection of programs were installed and tested without problems. The task of transfering and installing the programs for the system was greatly eased by the flexibility of the Multiformat approach and the implementation of the terminal emulators.

In addition to the standard package there is an additional software package that allows the reading and writing of PCDOS format discs. This package works the TORCHWR software in that it is totally menu driven and provides the ability to read the directory of both OSM and PCDOS discs, delete files from OSM and PCDOS, and to transfer files in either direction.

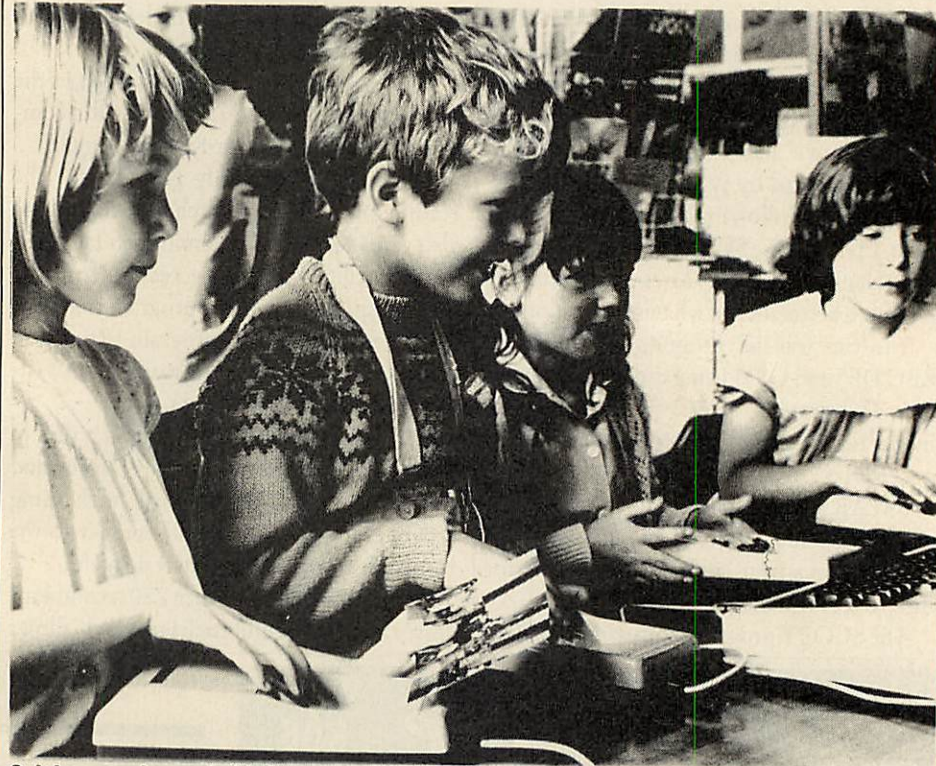
Multiform Z80 Second Processor, £299 and PCDOS Multiform Utility, £75, Technomatic Ltd, 17 Burnley Road, London NW10 1ED, Tel: 01-208 1177.

SOFTWARE

AS SIMPLE AS ABC

Chris Drage looks at wordprocessing packages for the younger user

A wordprocessor is a program that will allow text to be entered and edited and the results viewed on a monitor and printed on a printer. To date, wordprocessors for children have either been rather restrictive or overly complex. Finding the right balance has taken some time. The three second generation wordprocessing packages reviewed here break new ground in user friendliness and offer children a much better tool for writing.

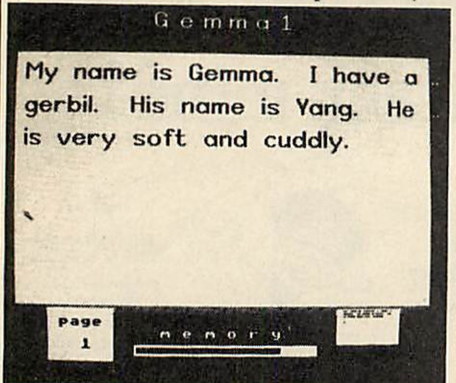


Quinkeys can be used with these second generation wordprocessors

Folio

I don't think I have ever found a wordprocessor so completely child-centred as *Folio* from Tedimen Software. Controlled from its menu of six options, *Folio* deliberately provides a limited range of facilities. Only the essential elements are there, enabling even the youngest of writers to get to grips with computer writing quickly and confidently.

All set-up options are controlled from an options page which is completely transparent to the children. From the menu the Write option enters the editor where a pen nib cursor flashes, inviting input. The character set is completely redefined in the large, print-script familiar to infants. Large black text on a cyan screen guarantees clarity whatever the type of monitor.



Folio's clear and uncluttered screen

The screen window comprises nine lines, of which the top and bottom lines always display half the text, reminding young children that their work has not totally disappeared. Document length is limited to about 1000 words maximum on a model B with Econet interface. This improves considerably with the B+ and Master 128. Other features of the writing screen are the memory meter which displays the amount of free memory available, the current page number and file name display and a page icon to show children the cursor's position in relation to the full page. Page breaks are represented by a black band. Seven function keys enable limited line operations to be performed. Lines may be joined, split, inserted and deleted. Combinations of Shift/CTRL and f1/f2 enable gross cursor movements to be performed.

Other menu options allow files to be saved, loaded and printed, the memory to be cleared for new work and *Folio* to be terminated. All operations may be reversed at a key press. The authors have taken great pains to ensure that *Folio* is well safety-netted and that every operation is logical, simple and can be undone. Error-message screens are easily read and the text is always preserved.

The options page provides a range of settings which configure the system to suit individual needs. These may be saved to the child's file thus preserving the settings for that child. The range of commands may be severely limited and introduced gradually as the child grows with the system. The current status of the system may also be saved with the file, thus ensuring a child can pick up exactly where he/she left off. A welcome feature is the ability to use the Concept Keyboard to allow simple key input of words, phrases or commands. An overlay editor is provided on the systems disc. *Prompt2* overlay files can also be loaded into the *Folio* editor.

The print option allows for large, medium and small output. The attractive, on-screen text is reproduced authentically on paper; proportionally spaced for legibility.

Although originally intended for infants, *Folio* can certainly be used higher up the school. It offers children an outstanding start to wordprocessing.

Pendown

Pendown from Logotron (of Logo fame), has been designed more as a writing environment for children than simply a wordprocessor. Its philosophy parallels that of *Folio*, being equally child-centred in its approach. As it is ROM/disc based it includes a wide range of facilities, some of which are provided on a utilities disc.

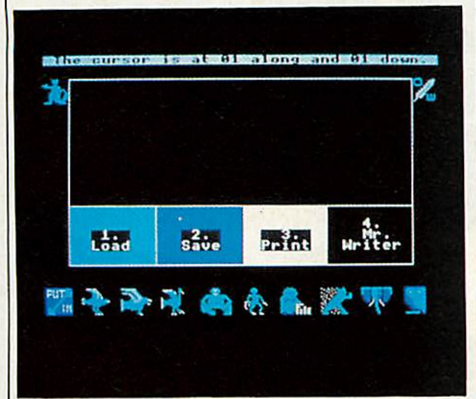
On typing *PD the editor is immediately

entered, avoiding a menu screen. A mode 7 screen of 40 columns is used, above which information relating to the cursor position, current line/page settings and bin status is displayed. A simple ruler is available beneath the information box. Text length is restricted to about 1200 words. Pressing f0 reveals the writing menu. Eleven settings relating to text revision, formatting, search/replace, Tab stop and Delete key use are available.

Each menu-box in *Pendown* overwrites the central part of the screen, the child's text still being visible around it. This reassures younger children that their text has not been lost. It is this thoughtful approach that so typifies the *Pendown* package.

Other function keys allow cut and copy, upper/lower case and a bins menu. The two bins provide temporary storage for text to be moved, copied or deleted, and each may hold approximately 350 words.

In addition to powerful text revision and formatting facilities *Pendown* offers a number of useful features also available from menus

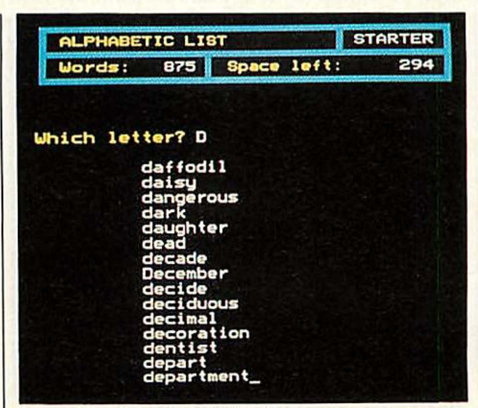


Wordplay's fun animated menagerie

accessed via the function key:

- on-line help with vocabulary and spelling
- on-line help screens to aid and give assistance to writers
- the ability to pre-plan the entire structure of the writing
- ability to use the Concept Keyboard or a similar device
- ability to print text using large typefaces

A dictionary is always available, providing children with over 800 correct spellings. This provides the child with a means of keeping a personal word bank, which can be searched



Searching Pendown's dictionary

alphabetically or by groups of words associated by theme or meaning. Lists may be altered, enlarged or reduced. The utilities disc provides a dictionary editor which takes the effort out of creating specific dictionaries. Similarly, help screens are always available to assist the writer.

Teachers may set up specific Help pages on any aspects they feel relevant to the needs of the children. The utilities disc provides a help page editor. Help files are so quickly and easily created that individual children could have their personal help pages available on their own work discs.

The Planner enables a tree-structured plan to be created which provides an outline for writing. Free movement is possible through the four branching levels (headings and subheadings), of the plan.

The plan can be transferred to the *Pendown* editor and saved to disc for repeated use. Each of these facilities has an important effect on the writing process – they reduce the need to interrupt the flow of writing.

In mode 7 there are at least eight keys which don't display their key characters on screen. This may be reason enough for using the Concept Keyboard with *Pendown*. A separate program on the utilities disc provides a very comprehensive editor program.

Overlays may be created for the 128 key version of the Concept Keyboard. Being driven entirely by the function keys, the editor allows groups of keypads to be defined, altered and tested without any specialist knowledge. Each overlay is limited to 640 characters (or 128 four-letter words or four 159-letter words). After *Starset* this really is the best Concept Keyboard editor I have used.

Other input devices like Quinkeys may be used with *Pendown* but the user must write his/her own interface utility.

Pendown was an immediate hit with my class of nine-year-olds because of the printer output. The range of fonts available make *Pendown* a truly versatile system. However, only Epson-compatible printers are catered for. The jumbo font is ideal for general primary school use. The ease with which large headings can be created for such things as wall displays



Pendown: the utilities disc

enthused the children. The chunky and horizon fonts were particularly popular. 80-column output is possible using the printer's normal font, but only teachers would require it. The utilities disc provides a powerful font editor. Small (40 column), medium (20 column) and large (10 column) fonts may be designed. Unfortunately, due to memory overheads only 31 large characters may be defined (eg, upper-case letters only). Up to 94 small/medium icons or characters may be defined (ASCII 33 to 126).

More able children were soon keen to design their own fonts. They derived enormous pleasure in seeing their work printed out in their own style of print.

Apart from its popularity with the children, I gauge the success of *Pendown* by the number of times I did not have to resort to the handbook for help. However, the 60-page manual explains the system's facilities simply and lucidly. *Pendown* represents a huge step forward in wordprocessing for children. It is a delight to use, providing a comprehensive range of facilities which are easily learnt and adapted by children.

Wordplay

Tape-based wordprocessors, by their very nature, are limited and cannot hope to compete with a ROM-based program. However, *Wordplay* from BBC Soft demonstrates what can be attained. To describe it as entertaining is an understatement. *Wordplay* comes complete with a detailed manual and program cassette. Disc users can transfer the program to disc via the Copier program.

The first screen that appears presents a number of cards which offer the facility to configure the printers, set the default filename, sound level and colours used. One card offers a spelling checker. Most of the default values are sensible and all that is necessary is to select the card for the editor.

Wordplay allows text to be input via the keyboard or the tape (disc) filing system. However, it is in the editing screen where *Wordplay*'s charm becomes apparent. The edit-screen is a nine-line page, each line being highlighted in blue. All text is clearly visible on a television set. *Wordplay* has room for approximately 33 lines, after which the file must be saved and a new one started. A selection of animal icons appears beneath the text,



Designing characters with Pendown

each of which is activated via the function keys. Each animal performs a particular task; Selina Seagull removes words, while Eve the Elephant right-justifies the text. Between them, most basic wordprocessor functions can be obtained. The manner in which each creature performs its task is delightful. Marcus Mouse scurries up the side of the screen, picks on the chosen letter, runs with it to the end of the line and drops it into Bardolf the Bin, who opens his lid to receive it. Naturally, children are entertained by the animated antics of this delightful menagerie.

If all editing is complete, the text may be saved and printed using Petronius Pelican. Files are saved under one default filename which can be altered via the initial cards or the spelling checker. The program may be configured to both parallel and serial dot-matrix printers. The spelling checker is a welcome feature of *Wordplay*, and up to 400 words may be stored. Unrecognised words in the text may be marked, altered and added to the dictionary. From disc the checker is quick and simple to use.

The program works well and does all it purports to do. All operations which are fairly drastic in consequence are trapped, minimis-

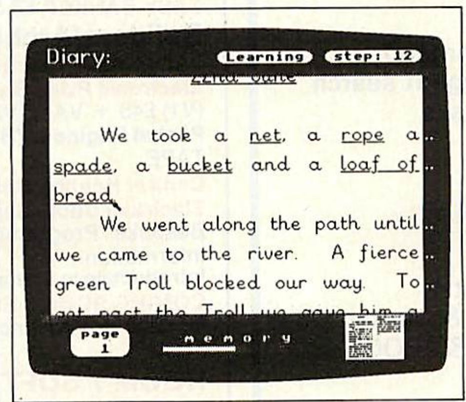
ing accidental loss of text. Unfortunately, the author has not trapped the Break key although the manual suggests how a Break key guard can be constructed.

The standard of the documentation included is very good. Every facility is covered in a section of its own.

At school I worked through the program with nine-year-olds who experienced few problems writing a story. These children, familiar with wordprocessing, became rather bored with animated operations as the novelty wore off.

The limitations of 33 lines per file, the rather laborious approach and the single print output exclude serious classroom applications. However, *Wordplay*'s novelty and simplicity make it ideal for home use; a delightful introduction to wordprocessing. Home users requiring educational software for their Electron or Beeb will find *Wordplay* a worthwhile investment.

A progression in levels of wordprocessing seems essential if real development is to take place in schools. These should range from a text editor suitable for quite young children with limited sight vocabulary, through to a



Children's stories on Folio

simple wordprocessor that allows unconstrained manipulation of text, to sophisticated systems with a wide range of facilities including spelling, checking and planning options.

Folio provides an excellent introduction to the process. Its large text and simplicity of use combined with its excellent child-centred design, result in a system that is ideal for infant/lower junior use.

For older children *Pendown* is an outstanding system, probably encompassing everything that a primary school requires in a wordprocessor. At £34 it represents excellent value for money.

Wordplay is fun and is a must for home use. Electron users should regard this program as a definitive start to the whole family's wordprocessing.

'Folio', £15, is available from Tedimen Software, PO Box 23, Southampton SO9 7BD. Tel: (0703) 473774. Runs on BBC B, B+ and Master 128. Education authority licences available.

'Pendown', £39 from Logotron, Ryman House, 59 Markham Street, London SW3 4NO. Tel: 01-352 1088. BBC B and B+.

'Wordplay', £11.95 by BBCSoft, 35 Marylebone High Street, London W1M 4AA. Tel: 01-927 4518. BBC B, B+, Electron (cassette).

EDUCATION

NEWS

North by north west

Soft-Teach Educational is a new company which has grown out of a service company to another publisher. Anna Bartholomew and Tony Ramsay have developed a variety of packages for Longman and have now decided to go it alone with their first offering, *General Map Reading*.

This package involves a high degree of pupil involvement, it generates problems in relation to a whole range of map-reading skills and then monitors the pupils' solution of the problem. This interactive method is not only effective in keeping the child's attention but also provides feedback to enhance learning.

The package is very simple and friendly to use, involving only the movement of the cursor and pressing Return. It is a useful package for the home and classroom as its instructional method is inbuilt. It may be used for group work or classroom demonstration, and further development is possible using the worksheets and colour map provided. The package costs £20 plus VAT or £40 plus VAT for a network version.

Contact Soft-Teach Educational, Sturgess Farmhouse, Longbridge Deverill, Warminster, BA12 7EA.

MESU questions asked

by Nick Evans

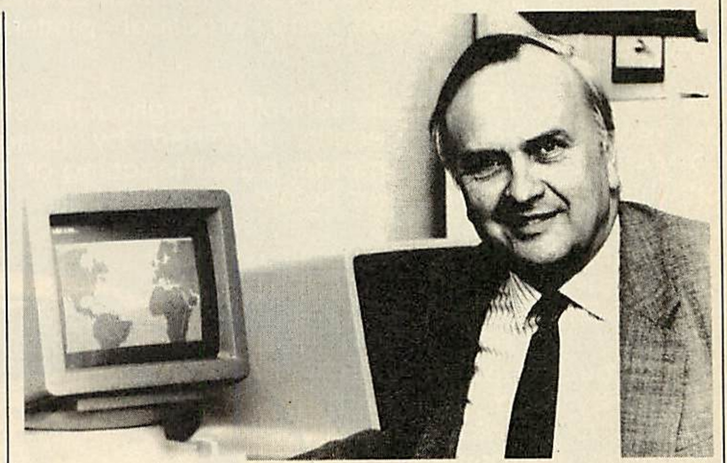
Since the disappearance of Microelectronics Education Programme (MEP) and the subsequent setting up of Microelectronics Education Support Unit (MESU) there has been a hiatus in educational computing circles.

The dissolution of MEP came as something of a surprise to many. Others looked at the expense and the inefficiency of innovative work and decided it was time to call a halt.

Even at this stage the less sceptical were prepared to believe that the end result would be a drastic pruning of resources.

In the end the whole structure was disbanded. Surprisingly, despite an acknowledged need to provide continuity there was no concrete move to set up MESU until just prior to MEP's demise. Consequently the appointment of the board, the new director and the hierarchy was spread over a long period. John Foster – the director of MESU – only took up his post in August and at the time of writing is isolated in a large hi-tech building with no staff. Worse still, there is little likelihood of appointees taking up posts until January 1987.

A hole has been left which has caused problems in terms of training teachers for Government schemes, providing information and general pioneering as technology moves forward.



John Foster: the new director of MESU

People's fears are outlined in the following questions. The blame for the problems does not lie anywhere specific – certainly not at John Foster's door, although he is the one who has to fend off the criticisms. In next month's *Acorn User* an interview with John Foster will bring out his feelings about the issues.

- Can MESU keep in contact with the grass roots out of which the people and projects of MEP grew, when operating from a single base?
- How will MESU deal with the frustration felt by those who are having to hold responsibility for training together until MESU comes on stream?
- Will MESU discard the momentum generated under MEP and can that momentum truly be sustained through the LEA centres?
- What will MESU do that is directly relevant to teachers in the classroom?
- How will MESU help teachers to bridge the widening chasm between developing technology and the classroom teacher, bearing in mind the small number of staff available for such work?
- Although people realise that MESU is not an MEP clone, how will the MESU work to its new brief without causing alienation?

The answers to these and other questions are likely to determine the success or otherwise of the fledgling MESU in the eyes of schools.

Commentary by Nick Evans

EDUCATION TOP FIVE

	Title	Publisher	Cassette	Disc	Machines*	Econet
1	Speech!	Superior	£9.95	£11.95	B	Yes
2	Music System	System	£13.00	£26.04	B/B+/M	Yes
3	Happy Letters	Bourne	£8.95	£10.95	B/B+/M/E	Yes
4	Fleet St Editor	Mirrorsoft	—	£39.95	B/B+/M	—
5	Happy Writing	Bourne	£8.95	£10.95	B/B+/E/M	Yes

Compiled by Gallup/MicroScope. Publishers: Superior Software, Regent House, Skinner Lane, Leeds 7, Tel: (0532) 459453; System, 12 Collegiate Crescent, Sheffield S10 2BA; Bourne Education Software, Bourne House, The Hundred, Romsey, Hants, SO5 8BY, Tel: (0794) 523301; Mirrorsoft, Maxwell House, 74 Worship Street, London EC2A 2EN, Tel: 01-377 4644 *Machines include the following: B (BBC); B+ (BBC Plus); M (Master); E (Electron)

NEWS

HS Software adds hardware

HS Software, formerly called Highlight Software, which was featured in May's Education News, has added hardware to its list of talents. Its 'Shapeway System' is an analogue interface box which allows the connection of heat probe, light sensor and other devices. It comes at a time when schools, particularly in the primary sector, need low-cost control and sensing devices. It costs £34.95 inc. VAT and p&p for the interface box, two probes and crocodile clip connectors as well as software and manual.

The user may make sample readings from the sensors at intervals of anything from 1/100th of a second to 100 seconds. The length of time of sampling may also be varied from a few seconds up to several days. The results may be plotted on to a graph which is dumped to a printer.

The system will also take variable voltage readings up to a maximum of 1.8v. I am assured by the manufacturers that if this is accidentally exceeded then a safety fuse will be burnt out, thereby protecting the circuitry of the micro. The same 'development' socket will also measure variable resistance and so variable potentiometers may be connected, interfaced for example to a pendulum or a moveable arm, in order to take readings to illustrate the position of the device at any given moment in time.

Contact HS Software at: 56 Hendrefoilan Avenue, Skeppy, Swansea SA2 7NB.

Logotron move

Logotron, the producer of Pendown and Logotron Logo, has moved to Dales Brewery, Gwydir Street, Cambridge CB1 2LJ. Tel: (0223) 323656.

Adventurous learning

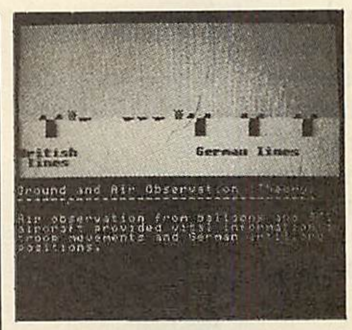
Comprehensive resource packs are a boon in the classroom at all ranges. If the teacher is given worksheets, project outlines, maps and other associated material, then the task of making that project work in the classroom is all the easier.

Tressell Publications produces packs which rival for volume of material even Cambridgeshire Software House's *Cars – Maths in Motion* pack.

Tressell's *Attack on the Somme* package (£16.99) is the smallest. It comprises a disc, two historical study books from its *Active Learning in the Humanities* series, a teacher's book and five copies of the pupil's workbook.

The package provides a medium for studying the nature of trench warfare, the lives of the soldiers and the decision-making which led to the disastrous loss of life in the Somme campaign. The unusual thing about this and the other packs is that they aim at the upper junior through to secondary GCSE standard.

Tressell's *Wagons West* package (£29.95) is a good deal more hefty.



Attack on the Somme from Tressell

As well as two discs there are four sets of nine information sheets, two posters, eight group cards, various sets of record sheets and a teacher's guide. The package aims to simulate the planning and hardships undertaken by settlers travelling to the Wild West.

Into the Unknown (£27) is a similar style of pack but aiming at the 15th-century explorer. Again, the software is a focus for a broad-based general study of many of the aspects of life in that time.

The educational thought behind these packages is based on very sound principles. The computer is not the centre of operations. It is a focus and a means to stimulate the work which the children are undertaking. For that reason, the support material which accompanies the packs encourage the user to work away from the computer. Moreover, they encourage an approach to history which is not based on cramming facts but on simulating and understanding the circumstances which led to events happening and a critical approach to evidence as it is presented.

Tressell is a teachers' co-operative which manages to produce high-quality materials at a low price. Commercial education software publishers, if they consider such complex packs, would charge up to three or four times the price for them. This material is excellent value for money. The support material is not dependent on the software and therefore may be used separately and, indeed is part of the comprehensive range of teaching material other than software which this company produces.

Tressell Publications, Lower Ground Floor, 70 Grand Parade, Brighton BN2 2JA Tel: (0273) 600186.

Hope for the future of MEP centres

John Foster, head of the MESU, has called a meeting later this term to pull together the fragmented MEP regional centres.

Education authorities have stepped in to fund several centres, although some are in a precarious situation. Others have been difficult to contact, so we would welcome hearing from them.

Those which seem to have disappeared are: Eastern Region at Chelmer Institute of Higher Education; Greater Manchester and Lancashire at Manchester Poly; East Midlands at Loughborough University; West and North Yorkshire at Leeds Poly.

Others are hanging on by a thread. Capital Region consortium fell through and, at the time of writing, no rescue plan was envisaged. Capital Media, the software publishing arm, is soldiering on in the person of Liz Williams. Merseyside with Cheshire, at Liverpool Poly, is continuing to fulfil an information and in service training role, as is South West region, now based at Brunel Technical College, Bristol.

The Welsh unit continues with training and publishing, and Northern Region at Newcastle has reformed into Northern Region Information Consortium Centre (NORICC), which will continue its publishing and information provision.

Chiltern's Advisory Unit (AUCBE) continues largely unchanged. South Yorks and Humberside will continue its RESOURCE venture.

West Midlands will continue at Shrewsbury, and Northern Ireland under NICED. Southern is split into SMIC east and west at Brighton and Southampton.

SEMERCs will continue with MESU funding for three years.

EDUCATION

HOME FROM SCHOOL

How computers in the home can be used to augment the learning process

Chris Drage and Nick Evans

Many people, in the first flush of enthusiasm for computers, justified their purchase by saying 'it's educational!'. Reluctant spouses, seeing immediate advantages for their children, were convinced. However, it soon became apparent that home education software was not always what it was cracked up to be. This article aims to explore ways in which computers might help to bridge the home/school divide. It will also suggest software packages that might help this process.

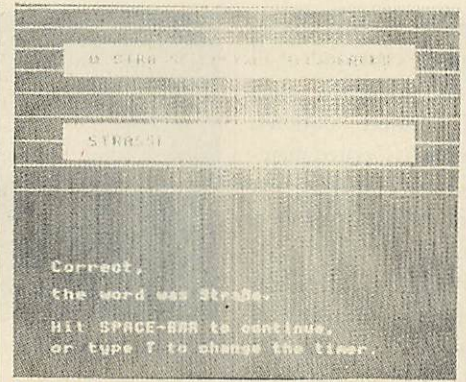
Although many homes have a personal computer, a large proportion do not and of those who do, not all possess the same make of equipment. Continuity from school to home can be, therefore, a difficult task. You must, however, make the best use of your equipment, and select software which is relevant to your child's needs and which will perform its function effectively.

What are the needs of your child? Children are not noted for communicating information about what went on at school, and teachers are even less inclined in many cases. And what is the 'function' of the software? If you're not a teacher, the educational validity of a package is not necessarily apparent – this is borne out by the inordinate numbers of drill and practice 'interrogation' packages which are sold under the banner of education. The availability of software is a further problem. Although you may know the title of a package used in school, many companies have no direct retail outlet to the home, as most educational software houses do not market in the High Street.

Solutions to these issues are not particularly easy to find so we will tackle them in two parts – types of software and educational needs.

Software styles

Drill and practice programs will perform a presentation on screen – a set of information or list of facts – and there will then follow a test on the content of the information. Although this process may be dressed up in a fancy costume, this type of program repeats the facts, and presents the questions and drills you until you get it all right. The kinder variety allows you to get it all wrong and then tells you what a failure you are by presenting you with an abysmal score! Some educationalists find the 'sledgehammer' technique effective in



Getting to grips with languages

cramming for examinations – I do not! Almost invariably information learnt in this fashion does not form any useful part of the structure of understanding of the subject. Apart from its advantages in learning long lists of, for example, vocabulary in modern languages, the validity of this type of material is dubious and most reputable educational software houses will have nothing to do with it.

Revision programs

At this point it would be useful to make the distinction between revision programs and teaching programs. If you want your child to revise something that they have already learned then the 'programmed learning' type of software may be useful. BBC Soft has become a master exponent of this type of presentation. The 'Computer Synchronised Audio' science programs allow the child to take an audio-visual tutorial in a range of subjects. The user's understanding of the topic in hand is tested at regular intervals. This is achieved through questioning but more often by performing a task which incorporates understanding the principles involved. The feedback from the program ensures, in a friendly fashion, that the children understand the topic before moving on. Many schools use BBC programs and they have gained a reputation for quality. The programs may be classified as 'revision' and 'teaching' types since it would be possible for a child of appropriate age to start with one from first principles.

A further program which is a fine example of its type is the 'learning by simulation' package. For example, *Introducing Geography* is a pack which takes a sideways look at the principles of geography. As the child follows the contours in *River*, in order to find the river which is the only route to the sea and survival, he or she learns the principles of contouring without this being explicitly explained. They learn by discovery. Similarly with other items in this pack, *Nomad* involves the reading of weather conditions in order to ensure a herd of cattle survives; *Flight* is a program which demands an understanding of navigation and *Summit* will test planning skills in an assault on Everest. It has also linked its modern language courses on television, *Deutsch Direkt* and *A Vous La France*, to computer programs.

This excellent software house has produced many educational programs of high quality and good value for money. Other companies have been less adventurous but just as enterprising, eg, Letts Revision Packs – its Key Facts cards – have been around for a long time. The little crib sheets which exam candidates finger in their pockets are now on tape and disc. Their structure has been changed to take advantage of the medium and as a revision method they are quite useful. Other companies performing the same type of service are Akadimias (English literature and history), John Wiley (technical and sciences), Medstat (modern languages) and AVP Computing which produces an interesting range of materials covering a broad band of topics.

Chalksoft has also been at the fore-front of this market with its ever-increasing range which includes the economic simulation *Yes Chancellor*, *Forensic* – a scientific research simulation and *Centre Ville* a modern language discovery program.

A list of publishers could go on and on: ESM, Acornsoft, ASK (now available only through ESM), Mirrorsoft, System, 4mation and many others, all of whom will complain they did not get a mention!

Teaching programs

As we have concentrated on revision so far, a large percentage of the readership will be protesting that we are neglecting the interests of the primary school child. There are many programs created which serve those needs well. Some, alas, are no more. Of the notables which survive all have one feature in common – originality of approach. Sherston Software

produces a wide range of programs which embody this idea. As an example, *Jolly Jack Tar* is the title of a music package for the primary age child. Using Jack as a medium the whole range of rhythm and pitch is explored in a simple and effective way. Sherston also produces adventures, reading programs and maths work. HS Software is another house which has managed to combine educational validity with a different approach. The end result in its *Adventurous English* set will grab the child's attention and does not easily pall. This is the main advantage over the 'sledgehammers' of the drill and practice brigade.

***Deutch Direkt* and *A Vous La France*: linking languages to the micro**

Programs that are repetitive, dull and unimaginative will not leave their boxes more than one or twice, unless there is a high level of motivation in the child.

We asked earlier 'What are the needs of your child?' As it is difficult to pin down specific needs which relate directly to the teaching they receive in school, it is important to find general areas that should be covered at home. Traditionally, the child has always brought home spellings, reading books and tables in primary school and a variety of subjects in secondary. With the computer it is generally advisable to cover certain fundamental skills and concepts throughout their school life. Although this list may not be complete and will be the subject of disagreement, broadly speaking its content will be useful.

At infant level children will be finding their way around the keyboard, learning the principles of operating the computer and finding the Break key with monotonous regularity!

- Matching programs develop the sense of shape and form and the skills that come before the complex matchings involved in reading.
- Number bonding is a skill which is developed well by the use of a computer. Constant feed-back with reward and encouragement helps develop basic number concepts which give an understanding that is the foundation of later skills.
- Simple puzzles develop a child's ability to tackle problems and develop ways of solving them (the *Mr Men* series from Mirrorsoft is a good example).
- Language development is promoted by any program which encourages a child to use language (not by typing but by understanding). Simple adventure games provide a medium for several of the skills mentioned above, in addition to language work.

All of the above are specific to skills. They are not dealing with a specific topic such as addition or spelling or words that contain 'ough'. If that specific knowledge arises, it is hidden in the general 'fun' of the package and is learned unawares.

Moving a little higher up the age range:

- Text handling: simple wordprocessing as a means to succeeding with words, even before writing has become second nature. Packages such as *Pendown* from Logotron and *Folio* from Tedimen will provide ample facilities which grow with the user. Not only is this a useful tool in itself, but it also provides a medium in which the child may organise his or her thoughts and prepare work that is to be presented in school. Consider also, if your child has problems with handwriting, that the



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	10 +	2.30 (b)
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	10 +	2.75 (b)
8721 disc controller		40.95 (a)
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Acorn DNFS 1.2		59.95 (a)
Acorn 1770 DFS		48.95 (a)
Acorn ADFS		28.95 (a)

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80tr d/s dual	254.95 (s)
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80tr d/s dual + PSU in Master Bridge	319.95 (s)
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GRW02 – 20MB Winchester, 40/80 drive + PSU in Master bridge	919.00 (s)
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Microvitec 1441 High Res	435.00 (s)
Mitsubishi 1404 Med Res	265.00 (s)
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Philips 7522 Amber Screen	86.95 (s)
Philips 7542 White Screen	86.95 (s)
Hantarex HX12 18MHz Green Screen	79.50 (s)

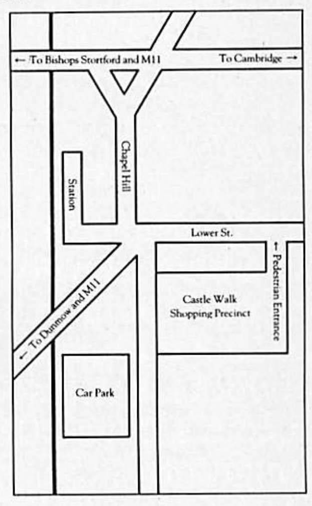
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computer may release him or her from this problem. Many a child with motor skills and co-ordination problems has found a way out of the cycle of failure in a wordprocessor. It by-passes their problem and allows the correction of errors before the final copy is presented. (See this month's Reviews pages for further information on wordprocessing packages for children.)

● Graphics: the 'picture processor' will allow the child's imagination to run riot. It's more difficult than paper and paint, but it's also different from them as well. The child can concentrate on form and design – no-one would claim that the computer's colour palette is anything but inferior to the paintbrush's. The ability to create, handle and edit a picture is a powerful facility.

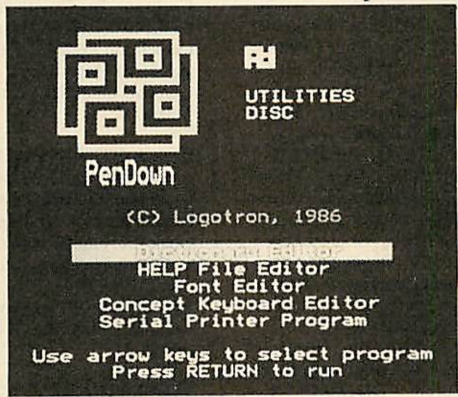
● Simulations and decision making: a whole range of materials exist which involve the child in a need to make decisions in a specific context, based on a limited amount of information. This is the stuff of real life. It teaches that responsibility has to be taken for actions. This type of material will apply to your child's development from upper primary throughout secondary school.

● Information handling using databases: I would suggest that this is not a home-based activity unless you can specifically relate it to study going on in the classroom. It requires an integration into other work which is unlikely to be found in the home. General work in structuring information may be a useful pastime such as cataloguing or preserving information on hobby-related topics.

What about programming?

Programming as a skill is fairly specialised. The comparison has been made in schools between computer programming and the study of Latin. Both are good disciplines, developing structured thought and logical processes, and in the main both are fairly useless in any practical way unless taken to a high level. As I duck to dodge the brickbats, I would say however that my comments refer to Basic programming. It can be fun and it can be an interesting hobby. Studied for its own sake under the heading of 'education' I would say it was a dubious activity, especially if the child is a reluctant pupil.

More satisfactory and rewarding is Logo programming. This develops all the thought processes mentioned earlier but is a language nearer to the spoken word. Statements in Logo are much more likely to make sense than those in Basic. Moreover, the mathematical concepts that develop initially, even with a simple turtle graphics program, are of far more value than learning to print your name on screen 500 times in multiple colours. Logo is a specialised field. If it is being used at your child's school, then take advice about the version to use and the ideas to develop. Which leads us on to the interface between parents' tasks and and those of the school.



Pendown: a wordprocessing package

Curriculum links

The problem with any work a parent undertakes at home in educational terms, is that it may pre-empt work done by the school. Teachers have even been known to throw up their hands in horror when little Johnny walks through the door on the first day of term able to read! The problem is even more acute with a computer because it relates to specific items of software that may be used both in the home and the school. It is important to work with the school and not in spite of it. Consult with the teachers. You may feel that you are being a nuisance but if you can summarise your aims and objectives on a piece of paper and push it in the right direction you may find that you save both money and effort.

Under no circumstances should you, upon learning that the children are 'doing', for instance, *Granny's Garden* (4mation), dash out and buy a copy. If so, you will destroy the development that the teacher is undertaking. Look for a package which tackles the same subject in a different way. The teacher may be able to advise you.

Above all, concentrate on skills. Specific subject areas may have pieces of software which relate to them. Whether they fit in with the thinking of the school and/or the examination boards is another matter. At home the more generalised idea of developing thought processes, broad concepts and skills will pay dividends in the child's schooling.

Who knows what the future holds? It is impossible to hazard a few interesting guesses however. How long will it be before most children carry a portable computer and plug in at both home and school? Ridiculous? Just think back to calculators and how ridiculous they seemed 20 years ago. Your child, if he or she is in primary education, will probably have access to on-line databases around the world, interactive video, telecommunications and computers of amazing power. You, the computer owner, have a chance to give a little of the ground work that will help him or her to come to terms with that future by providing the best that the present can offer.

SUPPLIERS' NAMES AND ADDRESSES

British Educational Software Associates (BESA)
4 Little Essex Street, London WC2R 3LF. Tel: 01-836 6633.
BBC Soft
35 Marylebone High Street, London W1M 4AA. Tel: 01-580 5577.
Letts
77 Borough Road, London SE1 1DW. Tel: 01-407 8891.
Akadimias
University College of North Wales, Bangor, Gwynedd LL57 2DG.
John Wiley
Baffins Lane, Chichester PO19 1UD. Tel: (0243) 784531.
Medstat
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Chalksoft
PO Box 49, Spalding, Lincs PE11 1NZ. Tel: (0775) 69518.
Sherston Software
8 Court Street, Malmesbury, Wilts SN16 0LL. Tel: (0666) 840433.
HS Software
56 Hendrefoilan Avenue, Sketty, Swansea SA2 7NB. Tel: (0792) 204519.
Mirrorsoft
Maxwell House, 74 Worship Street, London EC2A 2EN.
Logotron
Dales Brewery, Gwydir Street, Cambridge CB1 2LJ. Tel: (0223) 323656.
Tedimen Software
PO Box 23, Southampton SO9 7BD. Tel: (0703) 473774.
For a full list of educational software programs and houses, see the May 1986 issue of Acorn User.

EDUCATION

SHALL WE TALK?

Econet is a superb communications medium. We examine its potential in schools.

Robin Newman



One of the features which singles out the Acorn Econet from many other rivals, is its ability to allow direct machine-to-machine communication between stations on the network, as well as the more conventional link between network station and fileserver. Sadly this facility is all too often not used through ignorance of its power.

Even Acorn only pays lip-service with just three utilities, view, notify and remote, which exploit this feature in the standard Network Library, together with PROT and UNPROT which control their use.

However, extra utilities are appearing from a variety of sources which make full use of these facilities. I hope to review these in forthcoming issues, and would welcome comments from readers who have used them.

What can you do with them? Imagination is really the only limiting factor. Perhaps an illustration of the scope of the utilities used at Oundle School (some home-grown, others from elsewhere) will illustrate this.

One useful feature incorporated in most utility add-on packages is the ability to force a number of different stations to load and run the same program. This is also usually included in other non-Acorn networks, since it is possible to control it via the fileserver. A more general extension allows any sequence of commands to be executed by a selection of machines eg:

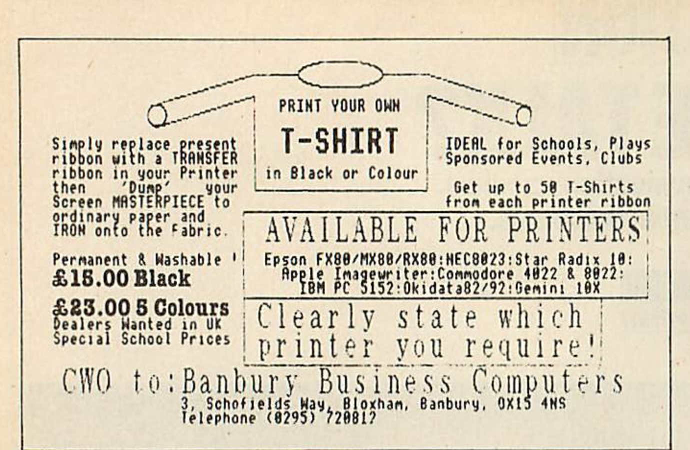
```
*I AM FRED
*DIR MATHS
LOAD "NUMBER"
```

A complementary facility is the ability to FETCH a program from one machine directly to another.

There are several facilities which enable a teacher to control the use of the network by the pupils. One is the ability to disable either the keyboards, screens or both of pupils' machines. It is also possible to put one machine in control of the keyboards of several others simultaneously (an extension of *REMOTE) which is useful when illustrating the editing features of wordprocessors.

The network is a superb communications medium. Facilities have been developed to allow a 'conference' arrangement whereby six or nine machines can talk to each other simultaneously, each having a two or three line display on the screen, each display being duplicated on all machines.

Felsted School has developed a noticeboard system which uses Econet to send messages to a series of machines with large monitors scattered throughout the school. Its large network is 2.5km long (incorporating several network 'bridges'), so it saves a lot of walking! It has also developed a chatline system, similar to that found on many phone-in bulletin boards. Indeed, even Acorn sells a 'mailbox' type sys-





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tem, although they don't seem to have admitted to it in any ads!

One pair of utilities we use frequently at Oundle enables several machines to be synchronised together by a 'pulse' sent round the network. This is useful when playing music programs. The code involved is fairly compact, and the idea was first developed by Dave Bisset (ex-Felsted School). Listing 1 on the yellow pages is the controlling CONDUCT program, and listing 2 should be added to the program which you wish to synchronise. This is most conveniently done by typing in the listing (minus the example program in lines 10-14) and spooling it to a text file, which can then be *EXECed on to the program you wish to be synchronised, eg having typed in the listing type:

*SPOOL SYNC >return<
LIST >return<
.....
.....
.....
(when listing is complete)
*SPOOL >return<

Now load in the program to be synchronised, and make sure that its line numbers are compatible, ie, there should be none before line 10 and none after 9990.

Finally type *EXEC SYNC, and the sync lines will be added to the program, which can then be saved.

To use the system, load the program into as many machines as you require, and run it, whereupon these machines will appear to go dead. In fact they are continually looking at the network, waiting for a synchronising pulse which is provided by the program CONDUCT, which should be run on another network machine to start the ball rolling.

If you don't want to wait for the reviews and want to get some network utilities straight away then try the addresses at the end, all of which can supply ones to suit a variety of tastes and pockets.

Mastering your network

With the advent of the new Master series machines I was anxious to get one on the network to find out what the compatibility problems were. In the event, I have been pleasantly surprised, and Acorn has done a good job in ensuring that the new machines will fit in with existing networks of model B machines. That's not to say that there are no problems, and the following points may help you to avoid the pitfalls.

Initially I was concerned to read in the machine 'spec' that pages &B and &C were to be allocated as network workspace. Much of our software used these pages in an illegal manner (officially they should only be used for function key and character definitions), and I saw the prospect of much rewriting. In the event I found that Acorn had provided the facility to reconfigure the Master so that it behaved like a model B. It is possible to raise the default value of page from &E00 to either &1000 or &1200, thus freeing pages &B and &C. This is achieved by using the configuration command *CONFIGURE SPACE (raises page to &1000) and *OPT 6,1 a further &200 to &1200. Both these commands take effect following a subsequent Control Break.

Alternatively the single command *FX162,17,5 followed by Control Break achieves the same result. One other reason for doing this is that existing network utilities like *NOTIFY, VIEW, etc, use page &E00 as workspace. The results on a Master will be embarrassing! Acorn does provide an alternative set of utilities for the Master machines which use workspace at &DD00. An additional facility allows the Masters to select these automatically from a second library directory.

The speed of data file handling is impressive on the Master, thanks to the ANFS chip, and the slow speed problems of the model B with BPUT, BGET, and PRINT and INPUT are a thing of the past.

The main problem I have found in converting network software for Master use, has been in those programs which *LOAD or *SAVE function key or character definitions in page &B and &C. I should emphasise that this is a general problem with the Master regardless of whether you use network or disc. The difficulty occurs because of the desirability of using one network program, and not a variety of different machines. The solution is fairly straightforward for character definitions, as it is merely a matter of relocating them to the correct place in the memory map &8900 to &8FFF.

The new Reference Manual Part 1 indicates how the latch ROMSEL & FE30 is adjusted to access the relevant section of memory by setting bit 7 of the latch (see section F.2). This must be carried out from assembler, as the Basic ROM will be paged out during access to the character definition RAM. An example program is shown in listing 3 which transfers page &C to &8F00, the location for characters 224 and 255. In use, some character definitions saved on a model B (eg, *SAVE chars C00 +100) are *LOADed into the Master at the same address, whereupon the command *SHIFT will run the utility to move them to the correct place in the memory map for characters 224 to 255.

Dealing with function key definitions is harder. Not only do they have to be relocated to &8000, but they are stored in a different format. This is because the soft key buffer has been increased to 1k, allowing longer key definitions. The pointers to the function key strings also behave in a different way when key definitions are deleted or added. The length is no problem, provided that the key definitions are kept to a length compatible with that of the model B, which will be the case if they originate in a model B.

I have developed two utilities, *KBM and *KMB, which automatically transfer key definitions loaded at page &B in model B format to the new format at &8000 in the Master, and vice versa. These can be selected automatically by reading the MOS version, and hence machine type, using *FXO, for example:

A%=0 X%=1:T%=(USR &FFF4 and &FF00)/&100:IF T%=3 OR T%=4 THEN *KBM

T% will be 3 for a Master 128 and 4 for a Master ET. KBM transfers key definitions from model B format loaded at page &B in a Master to Master format at &8000. KMB transfers the definitions in the opposite directions from whence they can be *SAVED.

Finally thank you to those who have written to The Network Page. Please keep your comments, suggestions and problems coming, so that the page can reflect your interests.

NAMES AND ADDRESSES

Acorn Computers, Cambridge, Technopark, Newmarket Road, Cambridge CB5 8PD.

Broadway Electronics (Mushroom Software), Aston Road, Bedford, Beds MK42 0LJ.

Digital Services Ltd, 159 Havant Road, Drayton, Portsmouth, Hampshire.

Felsted Computer Department, Felsted School, Dunmow, Essex CM6 3JG.

LTS Ltd, Haydon House, Alcester Road, Studley, Warwickshire B80 7AP.

MUSE, PO Box 43, Houghton-on-the-Hill, Leicester LE7 9GX.

The Microelectronics Centre, Blackpot Lane, Oundle, Peterborough PE8 4AT.

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Apologies to any others missed out through my ignorance, drop me a line.

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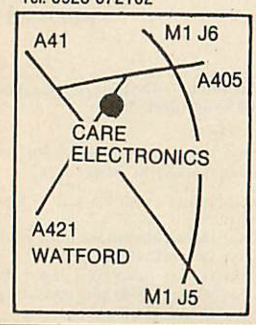
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NEWS

Database price cut

Gemini has cut the price of its *Datagem* database package by £50 and is making it available on cartridge for the Master. The program has been re-written to make use of Acorn's and Solidisk's advanced disc filing systems.

The price was £129.95, now both Beeb and Master versions are available for £79.95. Upgrading to the Master package costs £25.

Complete details of the package are available from Gemini, Concorde Road, Exmouth, Devon EX8 4RS.

Dual printers

Two printers can be connected to a micro with a new cable from Hardworks Ltd. With the T.Switch, daisywheel and dot matrix printers can be connected simultaneously or alternatively two printers with different paper. Printer selection is done via a switch.

The T.Switch costs £75. Details are available from Hardworks Ltd, 1 The Corner, Horsey, Great Yarmouth, Norfolk NR29 4EH.

New Master package

by Steve Mansfield

A single new package for the Master provides all *View* products plus enhanced features for linking the programs.

Overview contains *ViewStore*, *ViewSpell*, *ViewIndex* and *ViewPlot*, plus linking utilities which work with these titles and the *View* and *ViewSheet* programs already in the Master.

ViewStore is Acorn's database program. *ViewSpell* is a spelling checker for *View*, while *ViewIndex* is used to produce page indexes from wordprocessed text. *ViewPlot* is a plotting program which produces graphs from sets of figures, including those produced with the *ViewSheet* spreadsheet. It has all been crammed into a cartridge containing two 16k ROMs.



View Index: a feature of Overview

The most important of the utilities is a routine which automatically saves the working file onto sideways RAM when switching to an alternative program.

If in *View*, for example, switch to the *ViewSheet* spreadsheet and the *View* text is then saved in SRAM. When returning to *View*, the text is automatically loaded back in.

If sideways RAM becomes too full, the system will switch to disc for saving the file. This feature is easily switched on and off using a star command.

Acornsoft has also followed Computer Concepts by cramming more characters on the screen. Typing *WIDE gives 105 characters per line in mode 0 and 53 in mode 4.

Acornsoft briefly looked at providing the package for BBC B micros, but decided that the special ROM chips necessary would make it too expensive. As it is, the Master package is expected to retail at just under £100.

More details can be obtained from Acornsoft at Cambridge Technopark, 645 Newmarket Road, Cambridge CB5 8PD. Tel: (0223) 214411.

Interbase delayed again

Computer Concepts' database package, *InterBase*, has been delayed again, but the chip-based spelling checker should be with us soon.

InterBase is to be a programming language rather than a straightforward database.

InterBase utilises a completely new 28k language, the format of which is close to Basic.

Computer Concepts said that the software is slightly over 32k. The company could cut the program down to fit a 32k chip, but is more likely to add features and go for a 64k ROM.

The spelling checker ROM will be Computer Concepts' next release for the Beeb, and is now expected in October. The prototype is currently running at about 11,000 words a minute, and it will check text when entered.

While 128k ROM chips remain expensive and scarce, Computer Concepts will sell the spelling checker as two ROMs on a carrier board. The chips will still appear as one chip to the computer. The price is £69.

Computer Concepts can be contacted at Gaddesden Place, Hemel Hempstead, Herts HP2 6EX.

BUSINESS TOP FIVE

	Title	Publisher	Cassette	Disc	ROM	Electron	B+	Master	6502	Econet
1	Mini Office 2	Database	£14.95	£16.95	–	–	Yes	–	No	–
2	Database	Gemini	£19.95	£23.95	–	–	Yes	Yes	–	–
3	Desk Diary	Acornsoft	£6.99	–	–	Yes	–	–	–	–
4	Wordwise Plus	Computer Concepts	–	–	£56.35	–	Yes	Yes	Yes	Yes
5	View 3	Acornsoft	–	–	£89.70	–	Yes	Yes	Yes	Yes

Compiled by Gallup/MicroScope. Contact publishers: Database Publications, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY. Tel: 061-429 8080. Gemini, Gemini House, Dinan Way, Exmouth EX8 4RS. Computer Concepts, Gaddesden Place, Hemel Hempstead, Herts HP2 6EX. Tel: (0442) 63933. Acornsoft, 645 Newmarket Road, Cambridge CB5 8PD. Tel: (0223) 214411.

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John Vogler, A & B Computing, Sept 1985.

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John Dawson, Your Computer, Feb 1985.

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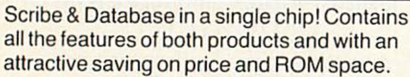
THE PROFESSIONAL WORD PROCESSOR designed for the serious user * All operations fully prompted * No special knowledge of the computer system necessary * Document size NOT limited by computer memory * Automatic disc buffering ensures text is moved between disc and computer memory without user intervention * Up to 255 pages in a single document * 80 column display * On screen underline and right justify * See it as it will be printed. SCRIBE comes in a chip with 5 minute fitting instructions, utilities disc and manual. Integrates with Database.

DATABASE £49.95



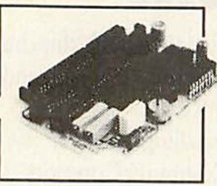
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BUSINESS

N E W S

Introducing Fred

An intelligent communications package, aimed at electronic mail users, has been launched by Aldoda International. The software, called *D*, is effectively a communications language.

Three versions are available, all on disc. The standard *D* software costs £25. There is a viewdata version, *D7*, at the same price, both together retail at £37.50.

The company has also released a viewdata frame editor by the name of *Fred*. As well as advanced teletext editing facilities, the program also features a sophisticated text editor.

The price of *Fred* starts at £43. For details contact Aldoda on 01-794 0991.

New System Delta range

Minerva has added to its range of application software programs based on the *System Delta* database generator.

The programs are aimed at video library owners, hoteliers, estate agents and school administrators. A newsagent package is near completion.

Video Rental tracks up to 5000 customers and indicates who has what, overdue items and a top ten. The program costs £54.95. *Hotelier* at £59.95, handles bookings, receipts and matching rooms to clients's needs. *Estate Agent* similarly matches houses to clients's needs and the schools' package can be used to produce detailed class and examination lists. Each will retail with a price tag of £69.96.

Other businesses are catered for with the introduction of three general business programs; an order processing and invoicing package at £45.95, a sales ledger for the same price plus a mailshot application for £19.95.

All the programs require the *System Delta* ROM to be present. This retails at £64.95.

Minerva has also published a detailed *Reference Guide* aimed at people wishing to develop applications.

Minerva can be contacted on (0392) 37756.



Designer discs

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SPELL IT OUT

ViewSpell drastically cuts the time spent checking processed text

Rob Macmillan

ILLUSTRATION BY SHONA CAMERON

Acornsoft's recently launched package, *ViewSpell,* boasts several useful features not found in many other spelling checkers, neither those for the BBC micro nor for other, more expensive, personal computers.

Features include a constant time for checking texts of any size, powerful single or multiple word look-up in the 77,709-word master dictionary or user dictionaries, and a compression of the master dictionary into just 178,534 bytes. I'll investigate the techniques used to achieve this power.

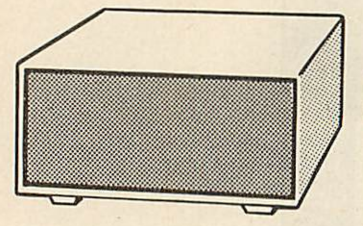
ViewSpell defines a word as being any collection of letters, decimal digits, apostrophes (') and hyphens (-), with the two restrictions that the first character must be a letter and the word may not be more than 32 characters long. It does not distinguish between upper and lower case letters. Letters are stored in upper case but printed out in lower case.

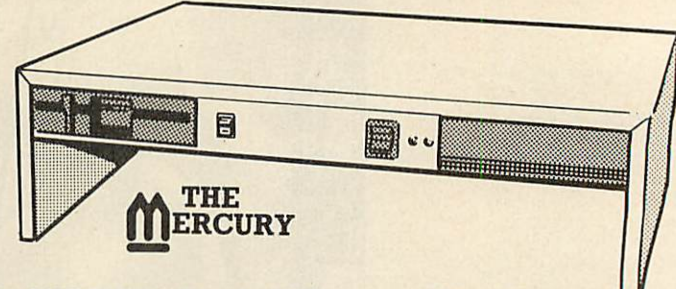
At first sight the most exciting feature of *ViewSpell* is the 77,709 word master dictionary. This is squeezed into 178,534 bytes – an average of less than 2.3 bytes per word. This compares with an average word length in the dictionary of over 8 letters and the usual computer representation of one byte per letter. So how is this compression achieved?

Each word is divided into three sections and each section is compressed in its own way. The

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IOUSLY	96	ATING	134	ATED	172	ENT	209
ISHING	97	URING	135	ATED	173	ARY	210
ICALLY	98	ENESS	136	INGS	173	EES	211
ATIONS	99	EMENT	137	YING	174	ERY	212
SOMELY	100	ERERS	138	AGED	175	ANS	213
NESSES	101	AGING	139	ENTS	176	ESE	214
IONING	102	HOOD	140	IALS	177	IFY	215
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INGLY	110	MENT	148	ING	185	ICS	223
FULLY	111	IEST	149	IED	186	ED	224
ISHED	112	ABLY	150	ISH	187	IC	225
STERS	113	IBLY	151	UAL	188	AL	226
ERING	114	IBLE	152	FUL	189	EN	227
ISING	115	EDLY	153	DOM	190	ER	228
IZING	116	ALLY	154	ISM	191	OR	229
ATION	117	IOUS	155	IAN	192	ES	230
ATORS	118	ICAL	156	MAN	193	LY	231
ATELY	119	FULS	157	MEN	194	AN	232
ENCES	120	IERS	158	ION	195	EE	233
ENTLY	121	IONS	159	IER	196	RY	234
ERIES	122	ISES	160	IES	197	CY	235
ESSES	123	IZES	161	EST	198	E	236
IALLY	124	ISTS	162	ILY	199	S	237
IVELY	125	IANS	163	ITY	200	Y	238
OUSLY	126	ISED	164	ERS	201	*	239
IFIES	127	IZED	165	ORS	202		
ANTLY	128	ATOR	166	ANT	203		

Table 1: A list of the most common endings in English with their associated tokens

three sections are: the initial letter; the 'root'; and the ending.

To serve as an example we will compress the following list of words:

compete
competes
competing
competitor
competitors
compute
computes
computing
computer
computers
computerise
computerises
computerising

and for simplicity we shall assume that they are the only words in the dictionary beginning with the letter 'c'.

The first letter of the word is coded very simply. It is thrown away. The dictionary is ordered alphabetically by initial letter and root (but not by ending) so all words beginning with 'a' come first followed by words beginning with 'b' and so on. *ViewSpell* keeps an index containing one entry of where in the list each of the 26 letter sections begins. So the initial letters do not need to be stored with each word and 75,000 initial letters are compressed into an index of about 100 bytes.

The index of initial letter positions is also used when searching for individual words. Instead of searching through the whole dictionary for the word 'zoo' *ViewSpell* just starts at the beginning of the 'z' section. This technique could be enhanced by building an index containing entries for the second letter in each word as well. This would speed up searching but would not enhance the root compression, which I'll consider a little later.

Common endings

From the beginning of each word we turn our attention to each word ending. There are many common endings in the English language and we use this fact to achieve the biggest compaction. *ViewSpell* knows about 160 common endings and each ending is encoded into just one byte. A file on the *ViewSpell* disc contains a list of the program expansions and this is loaded into the computer the first time *ViewSpell* performs a load or a search. The encoding is done by reserving ASCII codes 91 to 255 as endings. Remember words consist of capital letters, decimal digits, apostrophes (') and hyphens (-) and these characters are all in the range ASCII 32 to 90. You will see later how the codes ASCII 1 to 31 are used for further compaction.

ViewSpell's standard endings vary in length, up to eight characters. It strips from each word the longest ending that matches. This leaves the 'root' of the word and in the dictionary the roots are sorted into alphabetical order and followed by their lists of endings. Consequently when the dictionary is fully expanded it is not quite in alphabetical order since the endings are not ordered alphabetically.

Our word list now looks like this:

ompet/e/es/ing
ompetit/or/ors
omput/e/es/er/ers/ing
omputer/ise/ises/ising

Suppose the codes for standard endings were as follows:

e	&80
es	&81
ing	&82
or	&83
ors	&84
er	&85
ers	&86
ise	&87
ises	&88
ising	&89

Then the word list tranlates into:

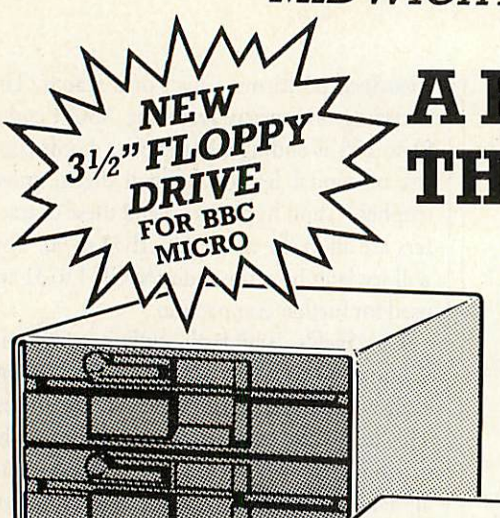
ompet &80 &81 &82
ompetit &83 &84
omput &80 &81 &85 &86 &82
omputer &87 &88 &89

This has reduced our thirteen words totalling 122 letters into 37 bytes. We still have a little way to go.

Since the roots are sorted into alphabetical order in the dictionary, consecutive roots typically have letters in common. In our example every root starts with 'omp'. We use this knowledge to squeeze the last bytes from our word list as follows.

The first root is 'ompet' and this is left as the five letters 'o', 'm', 'p', 'e', 't' in the dictionary. The second root 'ompetit' has its first five letters in common with the previous root. We simply replace the first five letters with the ASCII code 5 to denote five in common and add in the two new characters 'i', 't'. The next root 'omput' has three letters in common with the previous root and so this is encoded 3, 'u', 't'. Similarly 'omputer' is encoded 5, 'e', 'r'. So the final encoding becomes:

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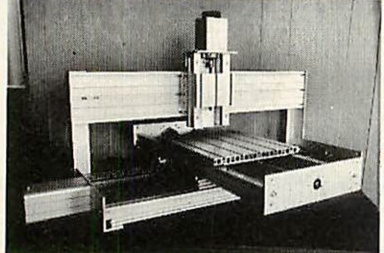
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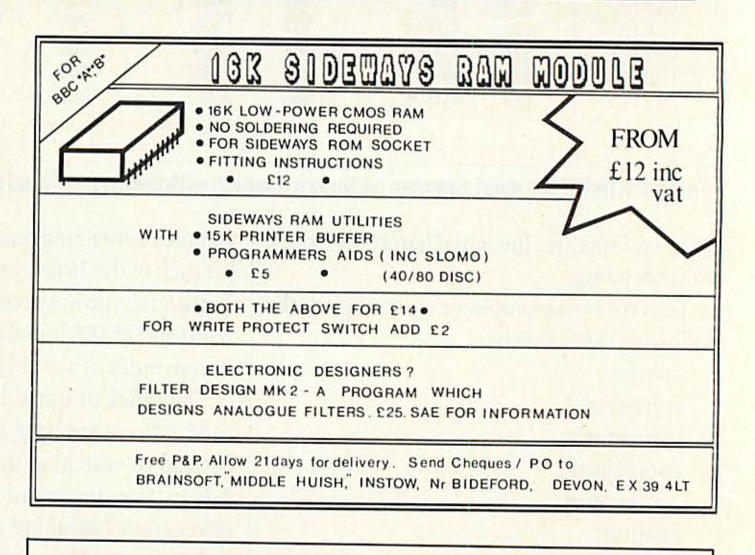
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&5 i t &83 &84
&3 u t &80 &81 &85 &86 &82
&5 e r &87 &88 &89

giving a total of 27 characters for 13 words.

ASCII codes are divided in the dictionary as follows:

0-31 number of characters similar to previous root
32-90 character in root
91-255 ending

Constant check time

Many spell checking programs process texts by reading a word at a time and looking for the word in the dictionary. This can happen when the text is being typed into a wordprocessor to provide interactive operation. Disadvantages of this approach are a slowing down of the wordprocessor and a possible distraction to the user. It is usually necessary to check the text again when the writing and editing have been finished.

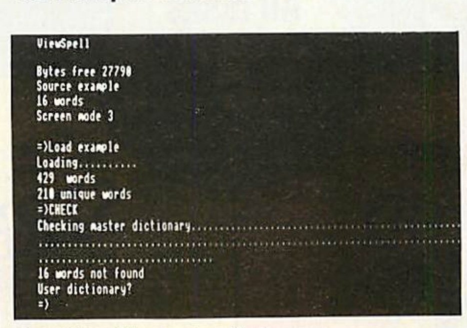
ViewSpell uses a different approach which precludes an interactive mode but provides a constant check time for documents of any size. Reading each word from the text and looking it up in the dictionary gives a check time in proportion to the number of words in the text. With *ViewSpell* the text is first read word-by-word and the words are sorted into alphabetical order (in reality, *ViewSpell* order). Then the word list is simply merged against the dictionary. The time taken to do this is dependent upon reading the dictionary from the disc, as comparing the words takes a negligible time. On the DFS this takes about 2.5 minutes, on Winchester with ADFS less than 20 seconds, with a RAM disc even faster. The check times are constant for large text files and the worst case.

In fact for small text files the times will be shorter. When merging, *ViewSpell* can sometimes skip parts of the dictionary. For example, if the only words beginning with the letter 'a' are 'a' and 'aardvark' the program will find these two words very quickly and go straight onto the 'b' section.

Sorting the words on loading enables *ViewSpell* to handle much larger documents than would fit in memory as ordinary text. Consequently only exceptional texts such as dictionary dumps will not fit into mode 3 on a BBC model B micro. For example a draft of the *ViewSpell* user guide contained 7240 words taking up 42,000 bytes. This became 968 unique words in *ViewSpell*, taking up just 5100 bytes. A draft of this article was 1079 words taking up 6471 bytes but 361 unique words taking up 1627 bytes in *ViewSpell*.



The *ViewSpell* User Guide



Searching the master dictionary

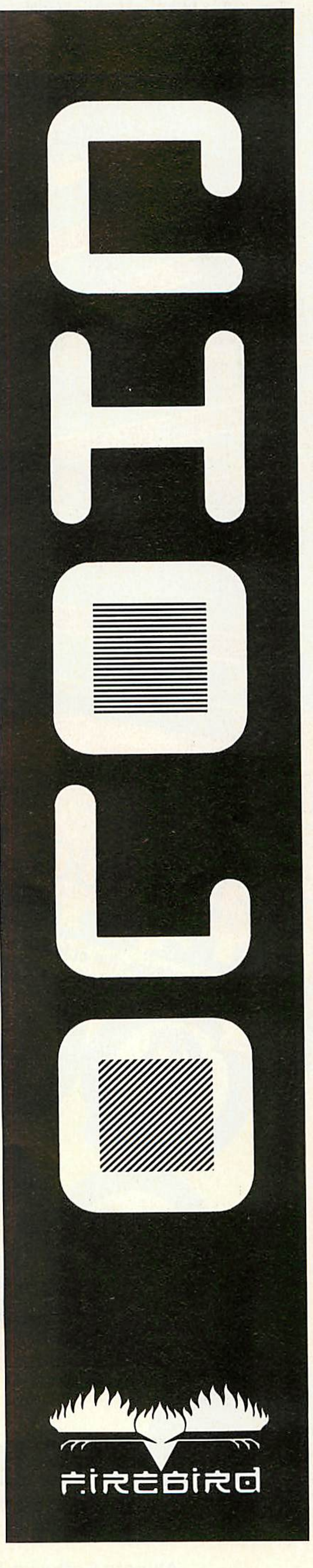
The master dictionary and its attributes are stored on disc in three files. W.master1 contains the words, T.master1 contains a list of the tokens and O.master1 contains a list of offsets to each of the 26 letter sections in W.master1. By duplicating these files it would be possible to run *ViewSpell* with a new master dictionary of, say, Welsh words. Since a different set of endings could be used, some research could be done to find the 160 most common Welsh word endings.

If you wish to build your own master dictionary contact Acornsoft.

Token endings

Table 1 is the list of endings that have been tokenised and their associated tokens. The compilation of the master dictionary and the research to find these endings was carried out by the Longman Publishing Group.

ViewSpell consists of a ROM, disc, User Guide and reference card. Runs on all BBC models, will not run on a 40 track disc drive (80 track only) or a 0.9 DFS. Available from Acornsoft for £39.95.





Alligata Software Ltd. 1 Orange Street, Sheffield S1 4DW. Tel: (0742) 755796

ACORN FORUM

Whether you've got a Master, BBC micro, Electron or Atom, Acorn User readers have some good ideas to share. Presented by Mike Barwise and Bruce Smith

DELVING INTO THE DISC DRIVE

Martin Phillips' comparative review of books covering the use of disc drives stirred up considerable controversy which resulted in a flood of letters into the *AU* office.

In his review Martin stated that side 0 of a disc drive is on the underside, ie the bottom – and on double sided drives, side 2 is the top side of the disc. This is the reverse of what

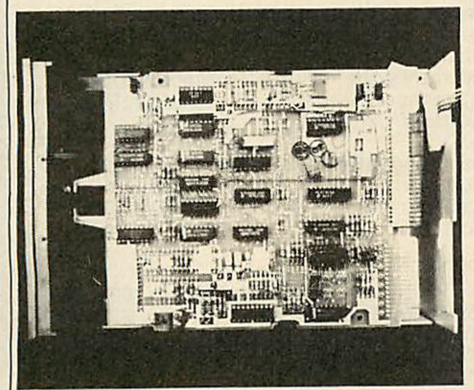


Figure 1. Bird's eye view of a track drive

many of you thought, that is that the top of the disc is side 0 and the bottom is side 2. The truth of the matter is that Martin is quite correct in his statement – side 0 (and thus drive 0) is on the bottom side of the disc and side 2 (drive 2) is on the upper top side!

In an effort to clear up this whole misconception, the following sequence of photographs should leave you in no doubt as to which is which as we pull apart a disc drive.

It is important to emphasise that the inner workings of a disc drive are very delicate and we do not recommend that you remove the case of your disc drive to examine its contents unless you are confident in your technical ability to do so safely.

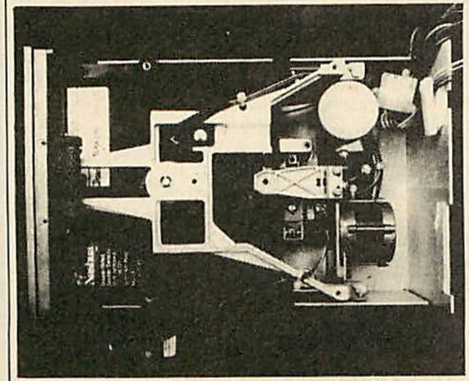


Figure 2. The mechanics of the disc drive

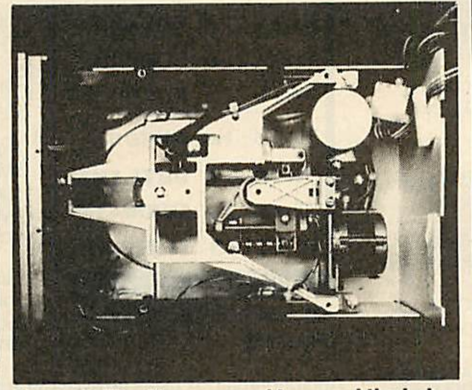


Figure 3. The disc removed to reveal the hub

Figure 1 shows a bird's eye view of an old Acorn 40 track drive from the *Acorn User* office with the top off. The front of the drive is to the left. The drive is dominated by its electronics and these are situated on a printed circuit board (PCB). The PCB contains all the chips and connections that allow your computer to talk to the disc surface. On the lower right-hand end of the PCB you can see what looks like a series of silver fingers (17 in all), this is an edge connector, which normally has connected to it the grey ribbon cable which

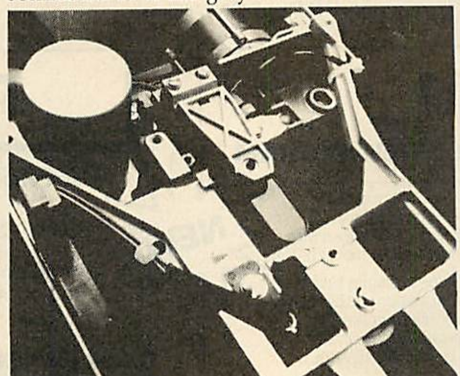


Figure 4. A close-up of the indexing detector

plugs into the disc drive port on the underside of your BBC micro/Master or relevant position on an Electron disc interface. The cable has, of course, been removed for the photograph. It is along this that information passes between the disc surface and computer. At the top right-hand side of the PCB, the four lead power cable can be seen trailing away. This plugs into the auxiliary power socket on a BBC micro or Master.

Many disc drives have a built-in power supply – in such cases this would be enclosed inside a metal case at the rear of the disc drive – to the right in the photograph.

Figure 2 shows the PCB removed. The mechanics of the disc drive are all exposed – and a disc can be seen sitting comfortably in position. Working through the picture from left to right we can see first of all that the disc drive door is open. The door controls the vertical movement of the wire cutter shaped mechanism spread across the inside of the case. This mechanism is hinged at the either side of the drive (top and bottom in the picture) where the two screw heads are located. When the door is closed the mechanism hinges down towards the disc. Situated in the centre of the hinging mechanism is the 'hub'. This is seen more clearly on figure 3 in which the disc has been removed. The hub is in effect a locating ring which fits into the spindle hole – the large hole in the centre of a disc. This locates the disc centrally in the drive and engages into

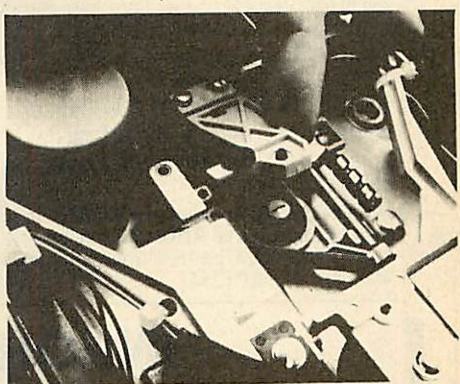


Figure 5. The read/write head is clearly seen

the disc motor which spins the disc.

In addition figure 3 clearly shows the small black rectangular assembly – this locates over the smaller hole on the disc – the index pulse hole. The rectangular box contains a light source/detector system which allows the drive to find the start of each track on the disc. A very small hole exists in this position on the disc – when it comes into position under the light source – light passes through it striking the sensor on the underside of the disc – known as the index pulse.

Figure 4 shows a close up of the indexing detector and hub. The disc is in position again and the surface of the disc can be seen through the read/write window on the disc envelope. The mechanism sitting over the top end of the read/write window contains a felt pressure pad on its underside and this holds the disc surface steady on the read/write head immediately below on the other side of the disc.

The final photograph in the sequence is taken in the same position as figure 4 but with

the disc removed and the pressure pad head held back. The read/write head can be clearly seen fixed on the base of the drive pointing upwards, the head shows as a shiny pointed surface. This clearly shows that on this single sided drive – side 0 is in fact on the bottom!

£5

SCRAMBLING BASIC FOR SECURITY

Graham Jones, a programmer from Rishton in Lancashire, gives us the benefit of his professional expertise in the following short routine. This provides a limited encryption/decryption facility to any BBC Basic program and earns him £5.

This is a very neat answer to the problem of 'low level' piracy (giving a copy to a friend) which can render good software unsaleable in no time at all. I must admit that I feel very strongly about this – few copiers stop to think how much time and effort have been put into what they are ripping off.

Graham writes: The routine works by 'scrambling' the contents of each program line according to the password input. Once the whole program has been scrambled, it can be saved just as any other normal Basic program, but if it is listed it will appear as a jumble of random-looking characters, control codes and keywords.

The only program line not to be scrambled is line zero, as this contains the password operated scramble/descrambler routine.

When you come to load your program back into memory (using CHAIN), the descrambling routine will be activated and you will be asked to enter the password. The only way to descramble the program is to enter exactly the same password that was used to scramble it.

To use the password routine, add the following to your program (after making a back-up for safety's sake):

```
    0 CLS:INPUT"Password :
 "P$':I%=PAGE+1:I%=I%+I%?2
:REPEAT:L%=256*?I%+I%?1:PR
INT"Line : ";L%;HR$13;:FOR
 B%=I%+3 TO I%+I%?2-2:?B%=
?B% EOR ASC(MID$(P$,(B%-I%
-2)MOD LEN(P$),1)):NEXTB%:
I%=I%+I%?2:UNTIL?I%=255:PR
INT'
```

To scramble your program, type: RUN >RETURN< then enter your password and press Return.

The line numbers currently being scrambled will appear on the screen. When the last program line has been scrambled, an error message will appear. This is because the computer has attempted to run the scrambled program. At this point you should *not* attempt to list your program under any circumstances. To save the program, just type: SAVE "PROGRAM" >RETURN>

When you have loaded a scrambled program (using CHAIN), you are asked to enter the password. Enter the same password that you used to scramble the program. The line numbers currently being descrambled will appear on the screen as before. When descrambling is complete, your program will run as normal.

£5

PRINTING ITALICS

R J Speight of Fownhope, Hereford earns himself a portrait of the Duke of Wellington for the following nifty program.

The new Epson LX-80 printer cannot mix italics with its Near Letter Quality (NLQ) text. However, the impossible is made possible with this short program:

```
 10 VDU 1,27,1,120,1,1
 20 VDU 1,27,1,120,1,0
 30 VDU 1,27,1,15
 40 VDU 1,27,1,87,1,1
 50 VDU 1,27,1,77
 60 VDU 1,27,1,69
 70 VDU 1,27,1,71
 80 VDU 1,27,1,52
 90 VDU 2
100 FOR N%=0 TO 4
110 FOR C%=32 TO 127
120 VDU C%:NEXT
130 NEXT
140 VDU 3
```

The program prints out the character set though any further text you print will be of course be in the NLQ italics mode!

£5

BEING BOLD

Jeffrey Morgan of Cardiff has sent in a useful routine for owners of the Brother HR-5 printer. While Jeffrey doesn't claim that his routine will give you NLQ print it will improve the quality of the lettering by making the printer print the same line of text twice, thereby giving a much bolder appearance to the letters.

The dip switch (8-segment parallel only) segment 102 is set to 'one', it must first be set to the 'off' position before using the program. The program is in fact a procedure and assumes that the line of text to be printed is passed into the procedure.

The procedure is as follows:

```
1000 DEF PROCprint(text$)
1010 VDU 2
1020 *FX 6,10
1030 PRINT text$,text$
1040 *FX 6
1050 PRINT CHR$(13)
1060 VDU 3
1070 ENDPROC
```

The procedure can be called in a variety of ways, passing the text directly with:

PROCprint("This is bold text")

or via a string with:

PROCprint(A$)

where A$ contains the text to be printed.

ADFS 'E' ATTRIBUTE RECOVERY

ADFS allows files to be only '*RUN' if attribute 'E' is specified by *ACCESS ie: *ACCESS <filename> E. This can be useful. However, once set, you will find it difficult to unset. There is no facility supplied to do this directly, but if you have an ADFS-compatible disc sector editor, such as that supplied with BBC Soft's *Monitor* ROM or ACP's *Advanced Disc Toolkit* ROM (*DEX), then there is a way around this. Suppose we have a directory $.GAMES as follows:

```
GAMES           (02)
Dir. GAMES      Lib. Library
PLANET2 E (01)  PROGRAM WR (02)
```

The file with the E attribute is PLANET2, and is stored in directory $.GAMES. You would therefore move into the directory containing the directory "GAMES", which in this case would be $.

Now enter *INFO <dir name>, This should present something like:

```
GAMES         DLR (01) 000224

<name>        <Access> <Sector>
```

Now run your disc editor to look at sector number <sector>. Move forward byte by byte until you find the filename of the 'E'-locked program. Make a note of the hex value shown by the fifth character of this name. Subtract 128 (&80) from this number and place this new value (hex) in its place.

Re-mount the disc using <*MOUNT> or <*ADFS> and you will find the file unaccessed. You can now use <*ACCESS> to set any attributes you require.

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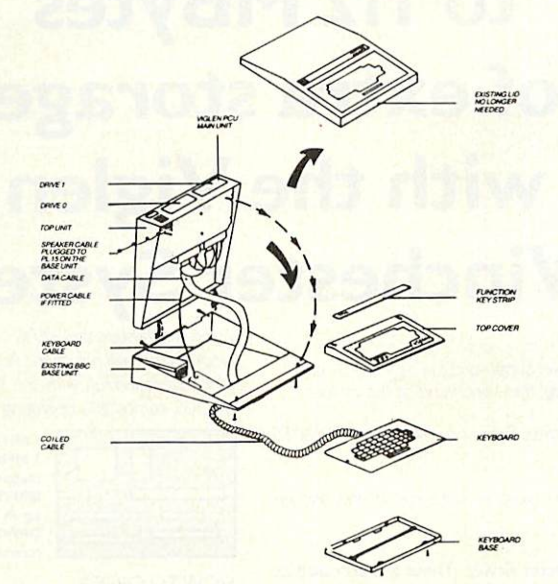


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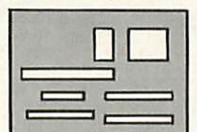
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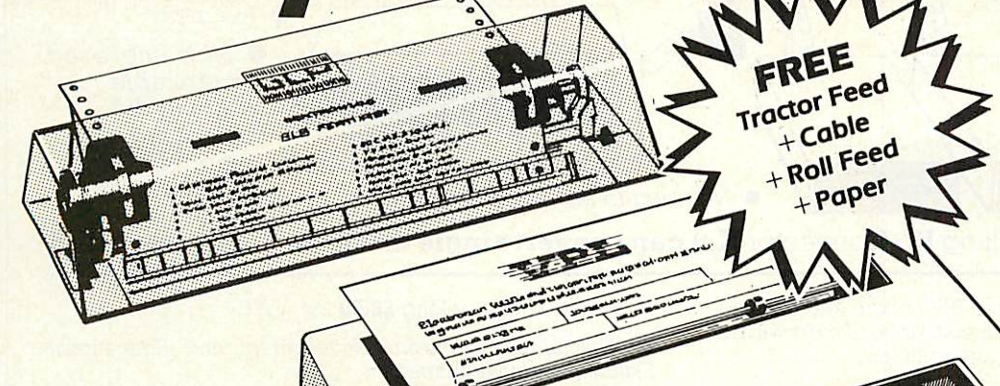
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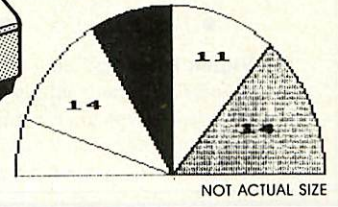


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```
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jumps over the laz
The quick brown fc
jumps over the laz
The quick brown fc
```

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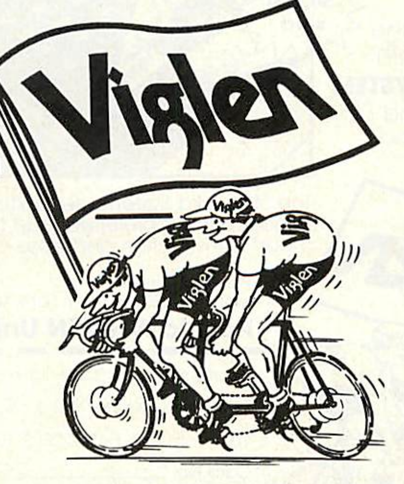
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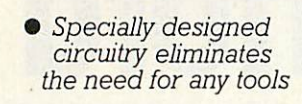
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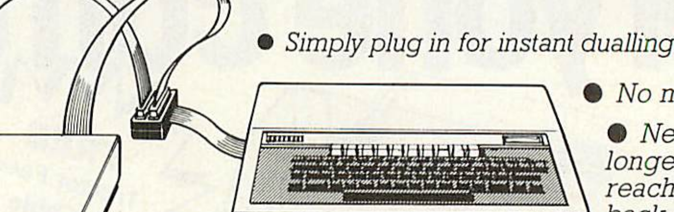
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Tick ✓ whether ☐BBC or ☐IBM
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Address......................................
....
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Card No ....
Signature.....................................

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East London. SOBAT Computer Club: Mr T A Kayani, 12 Calderon Road, London E11 4EU
Tel: 01-556 5423
North London. BBC Micro Users Group: Mr Ric Keyworth, 'The Penthouse', 4b Kilburn High Road, London NW6 5UL
Tel: 01-734 9235
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Wandsworth. Wandsworth Computer Club: C Kendrick, Earlsfield Library, Magdalen Road, London SW16
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Iver. Iver Computer Society: John Haigh, 11 Colliston Walk, Ford's Farm, Calcot, Reading, Berks RG3 5ZJ
Tel: (0734) 417534
North & Mid Essex. User Group (NAMEBUG): Andy Purkiss, 12 Palm Close, Witham, Essex
Tel: (0376) 515609. Prestel: 376515609
Reading. Reading User Group (RUG): Richard Rowlands,
Tel: Reading 596825 (eves)
South East Essex. BBC User Group (SEEBUG): Miss J Lines, 97 Oakhurst Drive, Wickford, Essex SS12 0NW
Tel: (03744) 63396
Sutton. Sutton Library Computer Club: The Secretary, 21 Village Row, Sutton, Surrey SM2 6JZ
Tel: 01-642 3102
Welling. Computer Users Club: Tony Latham, 69 Hadlow Road, Welling, Kent DA16 1AX

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Tel: Alton 87478
Bristol. Format 40/80 Club: BBC Disc User Group, Peter Hughes, 5 Marsh Street, Bristol BS1 4AA
Tel: (0272) 799979
Fareham. Porchester & Fareham Computer Club: Simon Ward, 9a East Cams Close, Downend, Fareham, Hants PO16 8RP
Gosport. Borough of Gosport BBC Users Group (BOGBUG), Graham Dubber, 128 Wych Lane, Gosport, Hants PO13 0TE
Tel: (0329) 282221 (evenings)
Radio. AMRAC (Amateur Radio and Computers): Mr T Triggel, Gleness, East Boldre, Brockenburst, Hants SO42 7WD
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Tel: (0283) 216445 (eves)
Cambridge. Bottisham Acorn User Group: Peter Rank, Tel Cambridge 812080, or Gerald Wilcockson, 19 Gallows Hill, Saffron Walden, Essex CB11 4DA
Tel: Saffron Walden 23793
Derby. The Derby Microcomputer Society: F Taylor, Secretary, c/o 5 Park View Close, Allestree, Derby DE3 2GH
Tel: Derby 559334
Glossop. Glossop Computer Club (Derbyshire): T S Fox, 4 Park Lane, Little Hayfield, Stockport, Cheshire SK12 5NW
Tel: (0663) 44260
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Norwich. Norwich & District BBC Microcomputer User Group: Roy Street, Church Farmhouse, Themelthorpe, Dareham, Norfolk NR20 5PS
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Redditch. Redditch Computer Club: Anthony Green, 14 Radway Close, Redditch, Worcs B98 8RZ
Tel: (0527) 61434
Stoke. POTBUG BBC User Group: J Forest, 50 Cliff Street, Smallthorne, Stoke-on-Trent, Staffs
Tel: 818430
Stratford. Stratford Computer Club: Chris Parry, 15 Kipling Road, Stratford-on-Avon
Tel: (0789) 68080
Suffolk. West Suffolk BBC Micro Users' Club: Antony Hurden, 14 Plovers Way, Bury St Edmunds, Suffolk IP33 2NJ

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Cumbria. West Cumbria User Group: P Majid Tel: (0946) 62732 or K Purkiss, Tel: (0946) 66586
Liverpool. Mersey BBC User Group: Nik Kelly, 56 Queen's Drive, Liverpool L4 6SH
Rochdale. Rochdale BBC Micro User Group: c/o 6 Dunbar Grove, Darnhill Estate, Heywood, Lancs OL10 3QJ
Wirral. Wirral Micro Users Club: David Walsh, 28 Priory Close, Bebington, Wirral, Merseyside L63 3EG

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Hull. Forum 80: 421 Endike Lane, Hull HU6 8AG
Hull. MUSE (for teachers): PO Box 43, 23 1/2 Friary Chambers, Whitefrairgate, Hull HU1 2HD
Tel: (0482) 20268
Keighly. Keighly Computer Club: Colin Price, 'Apple Garth', The Hob Hill, Steeton, Keighly, W Yorks
Tel: (0535) 54738
Newcastle. Newcastle & Washington BBC User Group (NEWBUG): Gary Bowmaker, c/o Washington Town Centre Library, The Galleries, Washington, Tyne & Wear
Tel: (0783) 813175 (eves)
Sheffield. Parsons Cross BBC User Group: Andrew Grant, 28 Rokeby Road, Sheffield S5 9FU
Tel: (0742) 461203
S Yorks. South Yorks Personal Computer Group: Bob Hindle, 139 Penrhyn Road, Sheffield S11 8UP
Wakefield. Wakefield BBC Micro User Group: PO Box 65, Wakefield, West Yorkshire WF2 6YZ

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Econet. User Group (Scotland): c/o Michael Ryan, Balkeerie Cottage, Eassie, by Forfar, Angus
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Australia: Dapto BBC User Group: PO Box 447, Dapto, NSW 2530
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Canary Islands (Spain). BBC Micro Club Tenerife: PO Box 560, 3800 Santa Cruz de Tenerife
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New Zealand. Christchurch BBC & Electron Users Group: Mrs Rebe Nolan, 87 Palmers Road, Christchurch 9
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Disc Users. Format 40/80 Club (BBC Disc User Group): Peter Hughes, 5 Marsh Street, Bristol BS1 4AA
Education. Micros and Primary Education (MAPE): c/o Mrs G Jones, 76 Sudbrooke Holme Drive, Sudbrooke, Lincs LN2 2SF
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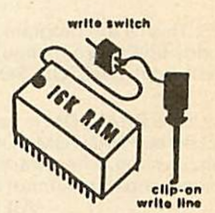
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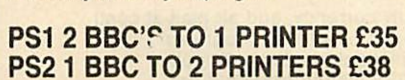
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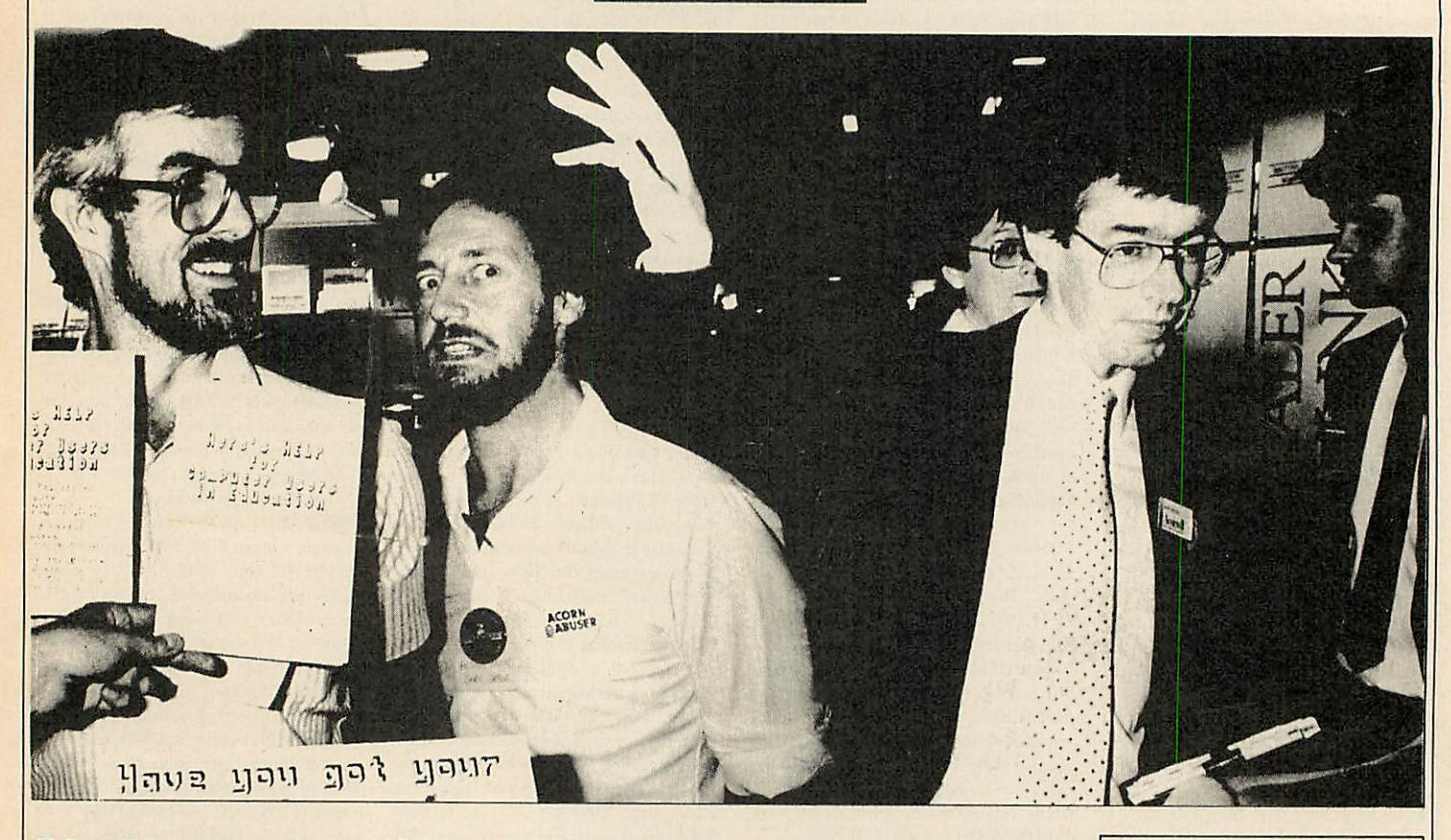
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ACORN USER'S

DIARY



Shell-shock serenade

The birthday cake has gone, and the 4th Official Baked Bean Can Show is over. Highlight was undoubtedly the Abuser works outing to a trattoria somewhere in darkest Cleveland Street.

Thirsty tired, shell-shocked souls crammed into a restaurant and a good time was had by all. The evening culminated in Señor Chris Drage strumming away on the classical guitar to the delight of the whole restaurant.

Unbeknown to us all (but revealed here for your delight), Drage spent his early days in the UK (he's a Kiwi) earning a few pennies singing in a local restaurant, and on his first date with his wife Alison left her sitting alone while he serenaded the entire restaurant!



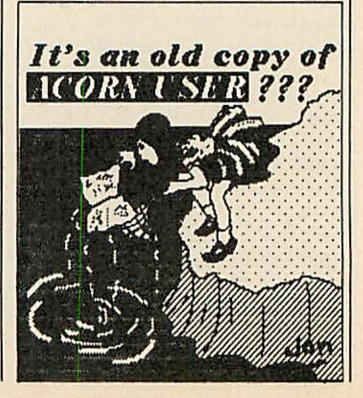
On your knees

At long last a winner to the anonymous knees competition in the August issue. No, it wasn't Jimmy Hill, though the smile and jawline bear a certain resemblance. It wasn't John Cleese or even old Brucey Smiff, but our education correspondent Nick Evans. Phil Borman's little ode said it all – watch out for it next month. Nick lives just up the road from Phil and will probably be paying him a visit!

Picture power

These fancy art packages like *Pagemaker* have a lot to answer for. Take the picture of Mr Spock here, digitised from the telly, and then 'Pagemakered' by Dave Watts of Essex user group Namebug. Then there's *Artroom* from Clares on the way – just look at the sample of abuse (right) from author Jon Warmisham.

Dear old Bob Coates from Acorn had to screw poor Chris Drage's head back on for him after a hard day at the Acorn User Show (above). It's really a bit of photographic trickery (though not done with *Pagemaker*), and forms this month's picture competition. What's your caption? There are Gallery Discs awaiting the best three witticisms.





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Thrust is simple, fun-to-play, yet totally realistic and intensely challenging. Your mission is to visit 24 planets in turn collecting the Klystron Pods and, if possible, destroying each planet's reactor system. Your spaceship and the pods, which are heavier than the spaceship, move authentically subject to the laws of gravity, inertia and momentum — indeed the game's author, Jeremy Smith holds a First-Class Honours degree in Physics! Careful planning of your manoeuvres is essential in order to prevent the pods swinging out of control and dragging your spaceship to destruction.
To add to the challenge, the planets have different gravity rates and, as you progress through the game, some have "reverse gravity" or "invisible landscapes". They are defended by automatic limpet guns strategically placed to protect the pods and fuel tanks — the only source of replenishment for your limited fuel supply. The smooth screen-scrolling, which is exemplary, and the realistic action gives the player a fascinating feeling of floating through space.
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